

# FORESTRY ABSTRACTS

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## NOTES ON PROGRESS IN FOREST SCIENCE

### PART II: FOREST PRODUCTS RESEARCH (EXCLUDING DAMAGE TO TIMBER)

#### NOMENCLATURE OF TIMBERS

The trend towards standardizing timber names has become very marked.

Recent publications include nomenclatures of tropical woods of Africa and South and Central America [F.A. 16 No. 2107; 18 Nos. 841, 3266]; Australian and S. African imported timbers [F.A. 16 Nos. 2108, 3319]; Spanish coniferous timbers [F.A. 16 No. 3318]; timbers of Indonesia, Malaya, N. Borneo and Sarawak [F.A. 17 No. 769]; and a British Standard nomenclature for timbers of economic importance in the U.K. [F.A. 17 No. 1906]. The principles and difficulties of compiling a world list were discussed by Rendle [F.A. 17 No. 1907] who appended to his article titles of officially sponsored lists (the earliest dating from 1937) from 20 countries in 5 continents.

#### WOOD ANATOMY (HISTOLOGY)

*Cell-wall structure.* Research on the fine structure of the cell wall is yielding interesting results. The development of electron and phase-contrast microscope techniques and vertical illumination with polarized light [F.A. 16 No. 859] have led to fuller knowledge of the structure of cellulose and the arrangement of fibrils in the cell wall [F.A. 16 Nos. 4480-1; 18 No. 4520]. The nature of the innermost layer of the secondary wall in conifers has provoked discussion, leading some investigators to revive the term 'tertiary wall'. Warty excrescences were observed on the inner surfaces of the walls, including those of pit cavities; they were found only in those cells that had this innermost layer [F.A. 16 No. 2148; 18 Nos. 862, 3285].

Examination of the fine structure of bordered pits has yielded information on the texture and shape of the torus in Spruce, Fir and Pine. This appears to be a flat disc (not lenticular in section) composed of microfibrils regularly arranged in a concentric pattern. The torus is sometimes perforated e.g. in Pine sapwood, and ease of penetration with preservatives is held to be related to this feature. The pit membrane consists of fine threads that scarcely seem strong enough to support the torus, and the spaces between (the 'perforations') are so fine that the membrane is held to serve as a filter rather than a sieve. One investigator claims that these so-called perforations are in fact closed by a layer of primary wall [F.A. 16 No. 3353; 17 Nos. 793, 1931; 18 No. 864].

There has been marked interest in the nature of tension wood; subjects investigated include the organization of the cell wall, its size, degree of lignification and texture, and the influence of its structure on mechanical properties [F.A. 16 No. 2154; 17 Nos. 1936-7, 3203-4]. Compared with normal wood, tension wood shows a high degree of crystallinity of cellulose and a physical interpretation of such concepts as the crystalline/non-crystalline ratio has been suggested [F.A. 18 No. 2071]. Studies of the distribution and cause of tension wood indicate that it is an anatomical response associated with maintaining inherent characters of tree form and with movements of orientation due to changes of environment [F.A. 17 No. 797; 18 Nos. 872, 3293].

*Fibre length.* Work on fibre-length mensuration has resulted in the elaboration of a new technique, which consists of microscopic projection of the fibres on a graduated circular target—hence called the 'graduated bull's-eye target method' [F.A. 16 No. 871]. A method of calculating the mean length of fibres in sawdust and wood-waste particles without maceration has been evolved and is of practical value where the average fibre length of the timber is well established [F.A. 18 No. 4522].

Measurements of fibres, on *Populus* spp. in particular, have shown them to be longer in late wood than early wood; fibre length increases with the number of the ring from the pith; and fast-grown trees produce longer fibres than slow-grown trees [F.A. 16 Nos. 2152-3; 17 No. 3201; 18 No. 4526].

In *Pithecolobium dulce*, septate fibres are longer than non-septate from the initial stages and their relative sizes are maintained throughout the ontogeny [F.A. 17 No. 795]. In *Ailanthus altissima*, fibre length decreases from the butt upward, and a correlation has been found between fibril angle and fibre length. Fibre diameter remains more or less constant, so that the length/diameter ratio, which is important in the paper industry, depends chiefly on the length [F.A. 18 No. 866].

In 3 storeyed hardwoods examined, the fibres did not show a tendency to increase in length from the pith outwards but length varied within the growth ring, reaching a maximum in the middle of the ring and dropping abruptly at the boundary [F.A. 17 No. 1935].



## PHYSICAL PROPERTIES OF WOOD

*Shrinkage.* In recent years researchers have devoted much attention to the role played by the rays in the early and late wood in the phenomenon of anisotropic shrinkage. American work with *Quercus borealis* and *Fagus grandifolia* has demonstrated the significant effect of rays, both broad and fine, in restraining shrinkage in the radial direction [F.A. 16 Nos. 2175, 4502; 17 No. 1956; 18 No. 4543]. When curves illustrating the relationship between radial shrinkage and the % of wood volume occupied by rays were extrapolated to zero ray volume, the theoretical radial shrinkage (for *F. grandifolia*) was found to be ca. 11.7%, which is roughly equal to the tangential shrinkage of early and late wood combined. Similar results were obtained by inserting measured values into an equation derived mathematically, so as to estimate the radial shrinkage of 'rayless' wood. It was further established that the tangential/radial-shrinkage ratios were ca. 2 for isolated ('rayless') early wood, and ca. 1 for isolated late wood, and that, for the wood as a whole, this ratio decreases from ca. 2 to 1 as the rays are removed. It was concluded that the fine ray tissue is responsible for the high ratio in early wood.

Another worker [F.A. 18 No. 4542] suggests that anisotropic shrinkage may be ascribed to dimensional changes in the vertical (prosenchyma) cells. This view is based mainly on the fact that the middle layer of the secondary wall in these cells alters greatly in thickness during annual growth, from a very thin layer in early wood to a very thick one in late wood, whereas the outer and inner layers remain practically unchanged in thickness. Since the fibrils of this middle layer lie nearly parallel to the main axis and those of the inner and outer layers nearly at right angles, it is held that transverse shrinkage must dominate in the late wood, and that whereas total shrinkage in the radial direction is the sum of the elementary transverse shrinkages of a number of successive layers of early and late wood, in the tangential direction the softer early wood, sandwiched as it is between two layers of relatively rigid late wood, gets squeezed into conformity with the greater shrinkage of the latter. The rays, on this hypothesis, are held to have some stiffening or restraining effect in the early-wood prosenchyma but to be ineffective in the thick-walled late-wood prosenchyma; while radial shrinkage is the result of both the small shrinkage of the rays and of the prosenchyma, tangential shrinkage is not affected by the high tangential shrinkage of the rays. The rays, as this worker demonstrates, are therefore likely to become regions of local separation of tissues, especially in the late wood of species in which the densities of early and late wood differ greatly.

A new method has been devised for measuring shrinkage anisotropy in wood [F.A. 17 No. 3221]; high-frequency heating and a stereo-microscope are used for determining the shrinkage of wood sections ca. 40 $\mu$  thick. The wood has been found to dry evenly without developing any stresses.

Tests made with *Pinus pentaphylla* [F.A. 18 No. 4541] disclosed the approximate relationship  $S = t/(a + bt)$  between the amount of shrinkage  $S$  (%) and the time of drying  $t$ , and the relationship  $S = ae^{bm} + cm + d$ , between  $S$  and the moisture content  $m$ , where  $a$ ,  $b$ ,  $c$  and  $d$  are constants,  $c$  and  $d$  becoming zero for longitudinal shrinkage generally and for radial shrinkage of heartwood. The ratios of tangential/radial and tangential/longitudinal shrinkage decrease in time, becoming 1.8 and ca. 30, respectively, at oven-dryness.

The shrinkage intersection point has often been used for calculating the 'fibre-saturation' moisture content (m.c.) of wood. One worker [F.A. 18 No. 2093] defines the shrinkage intersection point (s.i.p.) as the m.c. at which the extended linear portion of the shrinkage/m.c. curve intersects the line of zero shrinkage. The s.i.p. values determined for relatively large specimens of 6 species as the means of tangential and radial shrinkage measurements were found to be not significantly different from the values obtained with small basic-shrinkage specimens. Owing to non-linearity of the curve for 0-5% m.c., this range should not be used for determining the s.i.p. Use of the 5-12% m.c. range yields almost the same s.i.p. data as that of the whole linear portion. A certain degree of correlation was detected between s.i.p. and wood density.

## STRENGTH PROPERTIES OF WOOD

*Sampling for test pieces.* Hellowell and Warren [F.A. 18 No. 3313] have compared the established sampling method, in which multiple specimens are taken from each of 5 trees, with the random sampling of a single specimen each from a larger number of trees, as developed in Australia. Single specimens from each of 20 trees of *Knightia excelsa* gave, for static bending, results twice as accurate (in terms of probable standard error) as those obtained from 49 specimens from 5 trees. The single-specimen method was also found to give more accurate estimates of a species mean.

*Non-destructive testing.* With the development of improved methods of detecting and measuring vibrations, interest in non-destructive methods of testing timber has increased.

Use of resonant vibration in the audio-frequency range to determine longitudinal and transverse moduli of elasticity in specimens of second-growth Douglas Fir and some other species, showed that



shear deformation reduced the observed modulus in both sonic and static transverse tests by ca. 10% [F.A. 16 No. 2183]. When the appropriate corrections were introduced, the transverse modulus determined by sonic methods was found to be ca. 11% higher than that obtained by static methods; the value from longitudinal vibrations was somewhat higher than that obtained from transverse vibrations but when the correction for shear deformation was introduced, both values were of the same order. Again, working with a Beech specimen  $83 \times 5 \times 2.5$  cm., researchers in England found [F.A. 18 No. 912] that the modulus of elasticity as determined from bending vibrations was 3% less than the theoretically calculated value. In the case of *Sterculia rhinopetala*, tested in a specially designed apparatus for detecting the response of the beam to variations in vibrational frequency, the observed frequency values (for 3 different lengths) agreed well with those calculated from Raleigh's formula and corrected for shear [F.A. 16 No. 910].

Resonance woods (e.g. Spruce resonance wood) have been found to show a small internal friction value at low, and a relatively high one at high frequencies; this was determined by means of a specially designed electro-acoustical apparatus [F.A. 16 No. 2165] which was also used for determining the modulus of elasticity and the dependence of the loss factor on moisture content and elasticity.

The vibrational testing method has also been successfully applied to the non-destructive determination of glue-bond quality [F.A. 17 No. 2032]. It is claimed that all defects can be consistently detected, even if their length is as little as ca.  $\frac{1}{8}$  of the whole.

Determination of the damping and recoil factors in non-destructive testing appears to be a better method for comparative measurements [F.A. 18 No. 2102] than conventional impact-bending tests with the Hatt-Turner apparatus. The recoil and damping factor can supply good information on the shock resistance (energy absorbed per unit of volume) of timbers in the elastic region.

The vibrational method has also been used to determine the elastic properties of decaying material. With veneers of *Adina cordifolia*, *Dichopsis elliptica* and *Abies* sp. [F.A. 16 No. 909] the elastic constant was found to decrease and the damping capacity to increase as decay progressed. Recently attacked Beech, however, showed no significant difference in modulus of elasticity and damping as compared with sound Beech [F.A. 18 No. 912].

*Failure under compression.* The gradual development of failures in wood under compression was studied microscopically in Germany by subjecting  $2 \times 2 \times 3$  cm. test-pieces to Hoeffgen's 'stamp-compression', i.e. a hardness test with a flat-surfaced compression head [F.A. 16 No. 2186]. The loading rate was 50 kg./sq. cm./min.; as soon as indentation caused the resistance to drop, the load was held constant until equilibrium was reached between that load and the resistance. The load was then increased again until a further drop in resistance occurred, when it was again held until equilibrium; and so on. The periodic increase and fall of the load occurred several times, and the corresponding indentations increased steadily, reaching a large value at, roughly, the 7th fall in load. Microscopic investigations of the wood revealed a gradual development of failures in the tissues. The stamp-compression-hardness/compression-strength ratio was found to be 1.27.

*Strength of plywood.* The increased use of plywood for many purposes has focussed attention on its strength properties. On the basis of data available from standard tests on  $\frac{3}{8}$ -in. plywood, equations have been developed which, it is claimed from actual tests, will allow calculation of the bending, tension, compression and shear strengths of any plywood construction, including those containing two or more species of wood [F.A. 16 No. 3469].

*Strength of laminates.* In a similar approach using laminated timber, which is now increasingly used in structural engineering, stresses were analysed [F.A. 16 No. 4616] in two-species beams and equations developed, from theoretical premises, for calculating the strength of constructions of any form, on the basis of the standard properties of the component materials. These equations gave very good agreement with results of tests on actual sections having cores of *Abies nobilis* and laminations of *Swartzia leiocalycina* or *Sterculia rhinopetala*.

## PRACTICAL DEVELOPMENTS IN WOOD BENDING

*Solid wood.* Mankevič, reporting on an improved steaming chamber, already in industrial use in Russia [F.A. 16 No. 2397] recommends soaking air-dry wood in water at 80–85° C. in order to raise its moisture content to 30% before starting the steaming proper. To obtain higher yields of blanks with better surface quality, he further recommends [F.A. 18 No. 989] the use of bandsaws for rip-sawing Beech logs parallel to the bark, and of hollow-ground circular saws for cutting blanks from boards. In bending, he considers it is advisable to apply the bending force in the radial direction for curvature radii greater than 150 mm., and tangentially for smaller radii. In all cases, the % of rejects can be reduced by using metal straps.



*Laminated wood.* In studies with Beech and Oak bends made from laminae of uniform thickness [F.A. 18 No. 3386], Stevens and Turner have determined the final radius of curvature, after the instantaneous springback and subsequent prolonged creep when free to move, in conditions maintaining a 12% moisture content. For practical purposes, these movements were found to depend only on the number of laminae ( $n$ ), the relationship being  $r = r_1 n^2 / (n^2 - 1)$ , where  $r$  and  $r_1$  are the radii of final and forming curvature respectively. For Beech bends of  $\frac{1}{2}$  in. total thickness and 100 in. initial radius, the % radius changes for 2, 3, 4 and 5 laminae were determined experimentally to be 38, 11, 8 and 5%, respectively, compared with the calculated figures (from the above formula) of 33, 12, 7 and 4%.

### GLUES AND GLUING

*Properties and application.* With the growing demand for high-quality plywood and laminates, much study continues to be devoted to glues and their efficiency. The durability of all types has been the subject of a series of long-term weathering tests at Princes Risborough, England, where the phenolic and resorcinol groups proved their great superiority over animal, casein and urea types under severe conditions, always provided that the joints were made under adequate pressure [laminated beams, F.A. 17 No. 870; ply-clad frames, F.A. 18 No. 970; plywood glues, F.A. 18 No. 969]. In a further test, unpainted Beech and Okoumé plywood, bonded with phenol, resorcinol and melamine resins, and also with fortified and normal urea-formaldehyde, were exposed for 5 years in both England and Nigeria, (a) to the weather and (b) under shelter. Failure or degrade proved less rapid in England than in Nigeria, and only the first two named glues did not fail or suffer degrade [F.A. 17 No. 2037].

As regards application of glues to wood surfaces, American experiments indicate that the uniformity of spread and bond quality obtained when glue is sprayed compares well with ordinary roller methods. Exterior phenol-formaldehyde resins with furafil extender were used on rotary-cut Douglas Fir veneer seasoned below 5% m.c. The spray plant is described in detail [F.A. 18 No. 4618].

*Glue joints and surfaces.* Certain factors affecting the strength of glue joints have been under investigation in Russia and the U.S.A. In the former study [F.A. 18 No. 976], using a synthetic resin at 200 g./sq. m. to glue blocks of *Pinus sylvestris*, the surfaces to be glued were planed or sawn to give five degrees of unevenness. At pressures of 1, 3 and 5 kg./sq. cm. the shear strength of the joint was nearly 100 kg./sq. cm. for the smoothest (hand-planed) surface and 70 kg. for the four others. At 10 kg./sq. cm. pressure, however, the joint was almost equally strong for the most uneven (frame-sawn) surface as for the smoothest. It was concluded that glue-joint strength depends not only on evenness of surface but on the method of surface preparation, so far as this leaves the surface clean or 'woolly'; for the same degrees of unevenness, the rougher sawn surfaces gave stronger joints. In the latter study, a series of laboratory and factory trials [F.A. 18 No. 3407], Douglas Fir veneer was subjected to severe and prolonged drying schedules. When the veneers were subsequently glued together with phenolic glues, it was found that the higher the temperature or the longer the duration of drying of the veneers, the less was the strength of the glue bond, as expressed in the % of wood failure in cleavage tests. Microscopic examination revealed, however, that the failures were attributable to a reduction in the strength of the wood, the extremely shallow wood failure giving the macroscopic impression of glue failure.

### VENEER MANUFACTURE

A working schedule has been evolved in Canada for the manufacture of merchantable rotary veneer from curly Yellow Birch [F.A. 17 No. 4465]. The logs must be kept at a uniform temperature of not less than 150° F. during peeling; lower temperatures give raised fibres, preheating confers no advantage and if done at 200° imparts a reddish tinge to the wood. It was not possible to obtain good veneer of more than  $\frac{1}{16}$ -in. thickness. Suitable bevel and knife angles, and pressure-bar openings and bevels were found, and the optimum lathe settings and temperatures for different veneer thicknesses worked out.

Australian research has evolved a new compartment-type drier for rotary-peeled veneers [F.A. 17 No. 2064], capable of drying them without serious degrade and at economic cost to the low moisture content essential for hot pressing with synthetic glues. It incorporates a combined screen and straightener, with vertical racking of the veneers.

### WOOD PRESERVATION

*Characterization and detection of preservatives.* A new solvent-extraction method, based on the distribution of the oils involved between *n*-heptane and ODPN ( $\beta, \beta'$ -oxydipropionitrile), has been developed for investigating the content of toxic fractions in coal-tar creosotes and petroleum oils [F.A. 16 No. 4648]; also two chemical methods [F.A. 17 Nos. 929, 3367] for detecting very small proportions of PCP (pentachlorophenol) in wood.



*Volatility and volatile products of preservatives.* German investigators, using the Wicht apparatus and suitable temperatures, pressures, air humidities and velocities that reduced the test period to 1/25 of that in field tests, found the apparatus unsuitable for testing water-soluble, volatile preservatives; for oily volatile preservatives they introduced the magnitude *vaporization value*, measured as one-tenth of the loss in weight (mg./sq. dm.) over a 180-hour period at 20° C., 65% relative humidity and 1 m./sec. air velocity. On this basis a 5-weeks' standard test was proposed but, useful as the results obtained from Wicht's apparatus may be, it is considered that an exact estimation of the durability of the preservative effect can be got only from a protracted biological test [F.A. 16 No. 3495].

It is known that all inorganic fluorides interact with wood, giving rise to volatile compounds. Recent German work [F.A. 18 No. 4667] shows that, while the rate of formation and release of HF remains practically constant over a long period with fluorides and silicofluorides, it is very high during the first few months with bifluorides and then drops to a very small and constantly decreasing value.

*Absorption and penetration studies.* In studies on the effect of various factors on the uptake of liquids by wood when immersed [F.A. 18 No. 3436] it was found that for *Pinus sylvestris*, an increase of the time of immersion from 5 sec. to 1 min. increased the absorption by 40% for aqueous and 20% for oily solutions, as against 20% and 10% for *Picea abies*; the amount of preservative absorbed was doubled in *P. sylvestris* after 10 and 15–20 min. respectively for aqueous and oil solutions, the corresponding periods for *P. abies* being 15–20 min. and 1–2 hours. Unplaned wood absorbed about twice as much liquid as planed. For the first 1–2 minutes of immersion, uptake was slower in Pine than in Spruce, but for longer immersion periods the position was reversed. The uptake during short immersions usually decreased with increasing wood density. Salt concentration seemed to have no distinct effect on uptake, while wettability usually increased it.

A number of recent laboratory studies throw further light on the movement of preservatives under pressure. Gillwald found the rate of penetration to depend both on the surface tension and even more on the viscosity of the liquid [F.A. 18 No. 4680]. He believes that the permeability of wood can be kept constant, thus maintaining a linear relation between flow rate and pressure, if the pressure is raised gradually so as not to compress the small pores and channels. Rubeš reported that when aqueous preservatives carrying fine suspensions of different materials were forced through cylinders of Beech, the presence of dispersed particles markedly retarded the passage of the solution: aqueous solutions of surfactants had an equally potent effect, a 0.4% solution proving the most retardant [F.A. 18 No. 3433].

The effect of wood moisture content (m.c.) on penetration was investigated by Bellman [F.A. 16 No. 2336]. In Pine wood free from bluestain, the process of pressure impregnation was practically unaffected for moisture contents up to 25%; near fibre saturation point, in particular, penetration was no better than at low m.c. values. Bluestained wood, however, had to be dried to a lower m.c. for optimum penetration, though at 20% m.c. it allowed better penetration than unstained wood. Bellman gives mathematical relationships and graphs that allow the order of magnitude of penetration to be read off as a function of pressure, temperature and duration of the pressure process.

The lower fungi, notably *Trichoderma* and allied mould species, have been investigated in connexion with their capacity to increase the permeability and retentive capacity of wood for preservatives [F.A. 14 No. 2806; 15 Nos. 835, 2969]. Douglas Fir posts that had been sprayed with a 2% solution of NaF, with or without an inoculum of *Trichoderma* spores, or else left untreated to become heavily infected with mould, absorbed considerably larger quantities of preservative (equal parts of coal tar and light fuel oil) than posts that, through treatment with an equal mixture of Na pentachlorophenate and borax, had remained uninfected and unstained. Similar differences were found in depth and uniformity of penetration. Microscopic investigation showed that the fungi had destroyed parenchymatic tissues in wood rays and other parenchymatic cells, and thus created open passages in the sapwood [F.A. 16 Nos. 2364–5]. Similar results were obtained for various preservation processes with Black Spruce and Aspen, woods of poor natural penetrability. The influence of fungus infection associated with chemical barking on subsequent pressure and cold-soaking treatments was studied on Jack Pine. Posts cut from untreated trees and sprayed with 3% NaF, and others cut, 4 months after treatment, from trees poisoned with Na arsenite, showed abundant hyphae (mostly *Trichoderma* in the former, and various moulds and stains in the latter case) and open ray cells, while controls (posts cut from untreated trees or trees poisoned only a week previously) showed only scattered hyphae and mostly closed parenchyma cells. Here, too, both penetration and retention of an oily preservative was better in the infected samples [F.A. 18 No. 4675].

*New methods of preservation.* A new vacuum-pressure process for long-term preservation of wood is based on aqueous Cu formate and its chemical reaction with cellulose. When the reaction is complete, the Cu is believed to be involved in a cross-linking between adjacent cellulose molecules, the



resulting Cu-cellulose complex being resistant to leaching by water,  $\text{NH}_3$  and chelating agents. The total inhibition point of Cu to provide protection by this method against marine borers is ca. 0.15–0.20% and against fungi 0.25% [F.A. 18 No. 2203].

A method of alternating pressure, developed in Sweden by Henriksson [F.A. 16 No. 1083; 18 No. 2207] is based on a hypothesis regarding the mechanism of impregnation under a pressure-vacuum cycle. Experimental results show agreement with theory, viz. the pressure phase should be  $> 0.3$  of the total period and the most favourable cycle durations are between 0.5 and 10 min. It is important that the wood have a fair moisture content (e.g. Spruce not below 25%), but it must never be completely water-saturated since the presence of air is required to start the alternating cycle. In the tests described, the pressure applied was 9 atm., the vacuum 0.08 atm., and the number of cycles ca. 800 (in roughly 20 hours). At the end of the process the whole of the sapwood was filled with the solution (Boliden salt).

### STEAMING OF WOOD

A useful summary of literature on the effect of steaming on the physical and mechanical properties of wood, and of the merits of steaming in general, has been made by two workers in the Netherlands [F.A. 16 No. 1149]. Their experiments on specimens of Poplar show that steaming only slightly reduces the time needed for air or kiln drying, so that it would be economically justifiable only in cases where sterilization, change of colour or softening of the wood are involved. In recent studies by Kubinsky in Czechoslovakia [F.A. 18 No. 3466], on the effect of steaming on the movement of wood, Beech specimens were taken from vertically adjacent portions of growing trees so as to minimize the effect of differences in lignification, which is known to vary more in the transverse than in the axial direction. He established that, during air drying or conditioning, steamed Beech wood dries to a lower moisture content than unsteamed, all other conditions being equal; that, during absorption and desorption of water, it displays an amount of movement which varies in the same sense as the duration of steaming; and that the longer the steaming, the lower is the equilibrium moisture content.

### SEASONING OF WOOD

*Fundamental.* According to studies by Kollmann in Sweden [F.A. 16 No. 3539] using specially designed experimental kilns, three 'types' of drying can be distinguished so far as the influence of drying conditions on the rate of drying is concerned: (1) during the drying of very wet wood the rate of drying is constant, and does not depend on relative humidity so long as the latter is not too high; (2) during ideal and undisturbed diffusion-type drying, the rate of drying and the moisture content vary in the same sense, and, since moisture content varies in the same sense as relative humidity, the rate of drying should also vary in the same sense as relative humidity [paradoxical as this may sound]; (3) in practice, when the drying process is disturbed by stepwise changes of relative humidity and temperature, the rate of drying varies inversely as relative humidity.

For the evaporation rate of wood moisture at a constant drying rate, Japanese workers have developed the following formula [F.A. 17 No. 3408]:  $W' = K(C_0 - C')V^\alpha x^{\beta-1}\nu^\gamma$ , where  $W'$  is the rate of evaporation;  $V$ , air velocity;  $C_0 - C'$ , difference between vapour densities on the wood surface and in the air stream;  $x$ , length of air travel through the wood;  $\nu$ , dynamic air viscosity; and  $K$ ,  $\alpha$ ,  $\beta$  and  $\gamma$  are constants.

*Accelerated air drying.* Use has been made in Germany of a special mobile axial fan [F.A. 17 No. 972], to dry stacks in timber yards etc. more speedily. According to a graph, the following times were required to bring the moisture content of 50-mm. Oak boards of 0.63 g./c.c. air-dry density from 68 to 28%: (a) 1980 hours for unaided air-drying (at 10° C. average day temperature, and 64% relative humidity), (b) 1080 hours with the fan in operation for 12 hours daily (same conditions), and (c) 160 hours in a wall kiln at 40° C. The power consumption of the fan was 81 KWH/cu.m. of timber. The fan must not be used at night in cold weather.

*Internal-fan kilns.* The chronic problem of the non-uniformity of temperature and air-flow in standard kilns and that of temperature gradients in the timber to be dried have been studied by Kollmann [*loc. cit.*] and by Iwashita and Tanibuchi [F.A. 18 No. 1092]. Kollman found, for example, that when the circulating medium (superheated steam with or without air) had a temperature of ca. 150° C., all parts of a board 45 cm. long and 2.5 cm. thick attained a temperature of 97° in 10 min., whereas the front end of the board took 40 min., and its rear end 80 min. to reach 100°. The Japanese also found that the air velocity between boards was markedly less at the top of the stack than in other layers, and that the drop in the wet-bulb depression across the stack was slight with slow-drying woods (e.g. *Quercus serrata*), but considerable in fast-drying woods (e.g. *Cercidiphyllum japonicum*); to mitigate the effect of non-uniform air velocity, they recommend preliminary air seasoning of fast-drying woods before kiln treatment.



*High-temperature seasoning.* This method of seasoning, with its savings in both time and costs has attracted many investigations, the chief object of which has been to minimize the % of rejects. The effect of circulation rates of 400, 600 and 900 ft./min. (with the dry bulb held at 240° and the wet bulb at 200° F.) on the uniformity of drying and on degrade in *Picea glauca* was studied in Ottawa by Ladell [F.A. 17 Nos. 978, 3410]. He found that periodical reversal of the circulation evened out the temperature drop across the stack. Since the rate of 400 ft./min., even with this reversal, resulted in a drop of more than 5° (the maximum allowable in this type of drying), a minimum rate of 500 ft./min., periodically reversed, was accepted as suitable for a stack 3 ft. wide so as to obtain a reasonably uniform moisture content without unduly long conditioning periods. Very high circulation rates were shown to result in significantly shorter drying times, with little risk of degrade; these higher rates probably reduce the total cost of drying.

Keylwerth and co-workers in Germany have studied the temperature conditions, drying time, power consumption and distribution of air velocity for a charge of 3–4 cu.m. of trimmed sawn timber in a Benno Schilde superheated-steam drier [F.A. 17 No. 2168]; very good results were obtained, especially as regards the temperature and air-current conditions. Green or air-dry Pine or Spruce wood (18–45 mm.) could be seasoned in pure steam at 115–132° C., and air-dried broadleaved woods (Birch, Oak, Iroko, Teak, 20–80 mm.) at 110–127°. It is expedient to measure the temperature of the wood during seasoning so as to follow the moisture content of the wood below the fibre-saturation point. The power consumption with this kiln was slightly less than with kilns operating below 100°.

Mikit and Upmanis [F.A. 16 No. 1160] describe a high-temperature seasoning schedule, used in Latvia for furniture stock, which dries 50 × 80 mm. Pine and Spruce scantlings from 60–70 to 7–8% moisture content in 40 hours, viz.:—3 hours' steaming with saturated steam up to 100° C., the steam being conducted from the boiler into both kiln chamber and radiators; 8 hours' seasoning at 107°; 3 hours' heating at 98–100° with partial admission of saturated steam; again 8 hours at 107°, and so on.

*Boiling in petrolatum.* Boiling in petrolatum (crude petroleum jelly) has been used in some Soviet plants since 1954. Wood is boiled in open tanks with steam heating, the stickered stack being weighted down by a steel frame. Coniferous woods were dried at temperatures up to 140° C., Hornbeam, Beech and Oak at 100–120°. Practically no degrade is reported [F.A. 17 No. 2177]. The temperature of the hot bath is never allowed to drop, as this would cause the liquid to be drawn into the pores of the wood. It is claimed that the penetration of the viscous liquid does not exceed 1–1.5 mm., with a corresponding consumption of petrolatum amounting to 300–350 g./sq. m. of unplanned surface. The following examples of performance are given: (1) 2-cm. coniferous boards were dried from 45–50 to 5% moisture content at 120° C. in 3 hours; (2) Hornbeam scantlings, 5 × 6 cm., of 30% moisture content, were first steamed and then dried at 110–115° for 12 hours to 7% moisture content, with a very small m.c. gradient.

*Vapour drying.* A special conference held at Tarnow in May, 1955 [F.A. 17 No. 4538], reports Polish industrial experience and progress with this method of seasoning. Not only coniferous, but also some broadleaved woods (though not Beech and Oak) in the form of square stock have been dried satisfactorily in toluene vapour. No results are available for Oak; Beech with an initial moisture content above 40% developed case-hardening and inner checks.

In studies at Melbourne with *Eucalyptus gigantea* and *Nothofagus cunninghamii* [F.A. 16 No. 2410] marked degrade developed when green pieces, 1 in. thick, were subjected to vapour drying at atmospheric pressure and temperatures of 395° and 260° F.; better results were obtained with lower temperatures and reduced pressures, the optimum conditions being found at 150° and 25 mm. Hg absolute pressure. The average vapour-drying time for 1-in. *E. gigantea* was 5 days. Except for the unfavourable final moisture gradients in the timber, vapour drying was found to compare favourably with the best internal-fan kiln-drying methods.

*High-frequency drying.* Little work appears to have been done in this field. Birjukov [F.A. 16 No. 4726] recommends careful treatment of woods with poor permeability to moisture, when using dielectric heating, the temperature inside the drying material not to exceed 70° C., while the relative humidity of air in the kiln should be as high as possible (90–100%). Terazawa and Iwashita [F.A. 16 No. 3544] have carried out a detailed investigation on the operational costs of a high-frequency drying plant in which flooring planks made from 2- to 3-months' air-dried *Fagus crenata* were dried according to several schedules.



## ABSTRACT SECTION

### 0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

#### Translations

See Nos. 1807, 2256, 2336, 2385, 2450.

#### 0 (023). Elementary Works. Popular Manuals

1267. WECK, J. *Die Wälder der Erde*. [The world's forests.] Springer Verlag, Berlin—Göttingen—Heidelberg. 1957. pp. 152. 12 refs. [G.]

A short illustrated introduction for the intelligent layman, covering statistics, natural and artificial forest types, particularly tropical forests, productivity and demand for timber, and briefly discussing the main concepts of management and silviculture and the importance of forests for climate, erosion-control etc.

#### 0 (047.1). Progress Reports

1268. *Anales*. Instituto Forestal de Investigaciones y Experiencias, Madrid.

No. 1, 1956, is the first of a series of annual reports to be published on the work of the Institute. It includes a report from the regional centre at Lourizan. This issue contains 150 pages and many plates. Citation in *For. Abstr.*: *An. Inst. for. Invest. Exp., Madrid*.

1269. [1st annual Report of the Forest Experiment Station [1954].] Hiroshima Prefectural Forest Experiment Station, Kabe-machi Asa-gun, Hiroshima Prefecture. 1955. pp. 83. [Jap.]

Describes the situation, climate etc. of the new station (opened June 1954), its staffing, finance, research programme, and initial experimental layouts. As it is located in a district with 200 wood-working plants, most of which want training for their employees, the station is to provide the necessary facilities, and a syllabus for instruction in saw maintenance and woodworking generally is outlined.

1270. Report of the West African Timber Borer Research Unit. Crown Agents for Oversea Governments and Administrations, London.

The first report, for the years 1953–55, published

in 1957, price 5s., consists mainly of accounts of research on ambrosia beetles, referenced separately. Citation in *F.A.*: *Rep. W. Afr. Timb. Borer Res. Unit*.

#### 0 (048.1). Bibliographical Lists

See Nos. 1282, 1285, 1305, 1420, 1511, 1544, 1600, 1653, 1871, 1886, 2348, 2381, 2586.

#### 0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

1271. *Boletín del Instituto Forestal Latino Americano de Investigación y Capacitación*. Instituto Latino Americano de Investigación y Capacitación, Mérida.

No. 1, 1957 is mainly devoted to an article on the Institute itself [see *F.A.* 19 No. 2607]. Citation in *F.A.*: *Bol. Inst. for. Latino Amer., Mérida*.

1272. *El Forestal*. Ediciones Forestales S.R.L., Córdoba 2665, Buenos Aires. Monthly. Price \$50 per ann. (single copies \$5).

No. 1, January 1957, contains some 12 pages. The periodical will be devoted to the dissemination of information on forest products and associated industries. Citation in *F.A.*: *Forestal, B. Aires*.

#### 0 - 011. Terminology. Nomenclature

See also Nos. 2242–3.

1273. SAH, D. L. [Glossary of technical terms for use in Indian forestry.] Uttar Pradesh Forest Department, Allahabad. 1955. pp. 21. [Hindi] I.F.B.

Gives more than 700 terms in English with their Hindi equivalents, including the classical silvicultural systems.

1274. IRONSIDE, G. E. *English-Malay dictionary of forestry terms*. *Malay. For. Rec.* No. 21, 1957. pp. 33. Price *Malay* \$1.00.

A small pocket-sized volume.

### 1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.0. Practical Meteorology (Methods, Data, Forecasts etc.)

1275. [Research Station of the Tokyo University forests: Annual Report of meteorological observations in the Tokyo University Forests (1951–55)].

*Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (117–99). [Jap.]

Includes comprehensive data from 8 stations near 35° N. and 140° E., covering monthly means for atmospheric pressure, air and soil temperature, humidity, wind speed, sky conditions, rainfall and rainy days (of various amounts), etc.

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

1276. NEUWIRTH, R. *Ergebnisse neuerer luft- und niederschlagschemischer Untersuchungen und ihre Bedeutung für die Forstwirtschaft*. [Some recent investigations into the chemistry of air and of



**precipitation, and their significance for forestry.]** *Allg. Forst- u. Jagdztg.* 128 (7), 1957 (147-50). 12 refs. [G.g.e.]

Discusses recent Scandinavian and German work chiefly on: (a) CO<sub>2</sub> content of the air, in which meteorological factors cause so much variation that a general increase, even over long periods, would be difficult to ascertain [cf. *F.A.* 17 No. 1997]. (b) The mineral content of precipitation: Ca, K and Mg content were fairly adequate to the nutrient requirements of forests, the position of P was not clear, while N was clearly deficient. S and Cl compounds were precipitated faster than they could be assimilated. *From author's summary.*

### 111.2. Radiation and Temperature

See also No. 2131.

1277. ATKINS, E. S. **Light measurement in a study of White Pine reproduction.** *Tech. Note For. Br. Can.* No. 60, 1957. pp. 18. 11 refs.

Several experiments were carried out during the summers of 1953 and 1954, in the measurement of light available to White Pine seedlings in forest stands. Preliminary experiments with a Norwood Director light meter and a recording illuminometer indicated very similar trends with both instruments. Spot readings were taken on four  $\frac{1}{2}$ -acre plots to provide information on sampling intensity. The number of readings ranged from 255 at 10-foot intervals to 20 at 40-foot intervals. Results indicated that in a fairly uniform Pine stand of normal density the average of only 20 readings will give a reasonable indication of available light. However, in stands of lower density, somewhat erratic values may be obtained with such a small number of samples. Spot readings taken in a young Red Pine plantation on both overcast and bright days indicated that while the number of actual foot-candles was greater on the bright day, the % of light transmitted into the stand in relation to light in the open was greater on the overcast day. It is therefore suggested that instantaneous light readings be taken only at midday on clear bright days and when the control reading is at a prescribed standard such as 7500 foot-candles,  $\pm 10\%$ . From studies of individual seedlings and on regeneration within stands, the results suggest that a minimum of ca. 25% of the light in the open, is required for satisfactory growth of White Pine seedlings on a sandy site; this assumes that other factors are not limiting. The optimum light may be higher than this figure. Where the available light was very low ( $< 10\%$ ), the current height growth of regeneration was correspondingly poor. *From author's summary.*

1278. COOMBE, D. E. **The spectral composition of shade light in woodlands.** *J. Ecol.* 45 (3), 1957 (823-30). 14 refs.

The spectral composition and daylight factors of the shade light in *Picea abies* and *Castanea sativa* woodlands (at Heidelberg, Germany), with a rich associated flora, are compared. The canopy of a deciduous woodland is a highly selective filter of light, that of a coniferous woodland less so. As it is not always possible to say whether one woodland

site is 'lighter' or darker than another without specifying the wave-length, the author stresses the importance in ecological work of stating the spectral sensitivity of the apparatus used to measure the light. *From author's summary.*

### 111.7. Humidity, Evaporation. Clouds etc. Precipitation

See also No. 1276.

1279. **Machinery and equipment.** *World Crops* 9 (9), 1957 (391). O.R.E.

Describes the Auchincruive self-calculating blight forecast recorder, an instrument consisting of wet- and dry-bulb units with a calculator pen operated by the wet bulb, and set to record at a particular humidity. This automatically shows relative humidity and helps to fix the time for preventive spraying.

### 111.8. Climatology. Climate and Microclimate

See also Nos. 1288, 1352, 1765, 1811, 2134, 2154.

1280. **Notes on tropical climatology. The climatological atlas of Africa.** *Sols Africains*, Paris 4 (2), 1957 (136-45). 5 refs. [E.F.]

Lists, with their scales,  $> 100$  maps of the projected atlas, covering the physical features, vegetation, soils, rainfall, temperature, relative humidity, atmospheric circulation, solar radiation, evapo-transpiration, disease distribution, and tolerability (Brunt's criteria) of climate.

1281. CHEN, C. S. **[Climatic classification and climatic regions of China.]** *Memoirs of the College of Agriculture, National Taiwan University, Taipei* 4 (3), 1956 (1-42). 31 refs. [Chin.e.e.] C.G.B.

Discusses classification systems and gives data on various climatic factors, including length of growing season, and moisture and temperature distributions over the seasons, with sketchmaps. A demarcation of China into 14 major climatic regions, based largely on Thornthwaite's principles, with notes on natural vegetation and main crops is presented. *From author's summary.*

1282. DORDICK, I. L., and THURONYI, G. **Selective annotated bibliography on climate of the forest.** *Photostat from Meteorological Abstracts and Bibliography*, Boston 8 (4), 1957 (515-39). 109 refs.

Presents a representative selection of papers in which forest climates have been studied from the aspects of heat balance, the characteristics of the meteorological variables as modified in the forest, and the nature of forest climates as a transition climate.

1283. SELLECK, G. W., and SCHUPPERT, K. **Some aspects of microclimate in a Pine forest and in an adjacent prairie.** *Ecology* 38 (4), 1957 (650-3). 10 refs.

Measurements were made (a) in a *Pinus resinosa* plantation (23 years old) and (b) in adjacent open prairie. Water loss in (b) was 74 times that in (a). The forest canopy modified extremes of temperature and humidity, and maintained longer periods of higher humidity than (b). Random distribution of trees in a forest may be an important factor in the



modification of temperature extremes as compared with a plantation of regularly spaced trees. *From authors' summary.*

1284. I. Celostátní bioklimatologická konference v Liblicích 19.–20. května 1955. Sborník dokumentů. [The First National Bioclimatological Conference at Liblice, 19–20 May, 1955. Collection of papers.] Československá Akademie Věd, Biologická Sekce, Praha, 1956. pp. 163. [Cz.]

Includes the following reports of forestry interest: (1) Forest meteorology and climatology (*V. Krečmer*); (2) Criticism of the methods of observation in forest phenology (*J. Hofman*); (3) Ecoclimate of group felling in mixed stands (*B. Slavík*); (4) Comparison of minimum temperatures under different conifer species and outside the forest (*M. Tyller*); (5) Microclimatic investigation of air currents (*M. Tyller*); and (6) Problems of bioclimatological research in silviculture (*J. Jurča*).

### 113. Situation

See No. 1301.

### 114. Soil. Soil Science

1285. Bibliography of soil science, fertilizers and general agronomy, 1953–1956. Commonwealth Bureau of Soils, Harpenden. 1957. pp. xxii + 661. Price £3. 10s.

#### 114.1. Soil Physics

See also Nos. 1292, 1623, 1660.

1286. MUSTAFAEV, H. M. Izmenenie svojstv obyknovennogo černozema pod lesnymi polosami različnogo vozrasta v mežpolosnom prostranstve. [Changes in the properties of ordinary chernozems under shelterbelts of different ages [and] in the space between belts.] *Počvoved.* 1957 (6), (102–7). 14 refs. [Russ.e.] A.P.B.

Studies were made on heavy loamy chernozems in Kuibyshev province under stands of pure Oak or Oak in mixture with Maple and/or Ash, aged 3, 12, 14, 16 or 60 years. Data are tabulated for each stand on sp. gr., bulk density and porosity at various depths and on infiltration capacity. Experiments were also made in the 60-year stand to determine infiltration capacity, surface run-off and erosion, with and without a litter layer. Results show that in ordinary chernozems under shelterbelts the percentage of water-stable aggregates > 1 mm. increases with the age of the stand; in the top horizon under the 60-year stand it was between 70 and 90%, or ca. 30–35 times that of ploughed land. Simultaneously, porosity, infiltration capacity, and resistance to erosion were improved. The favourable influence of the belts on these physical properties extends 50–70 m. (or 5–7 times the height of the stand) beyond their margins. The infiltration capacity of plots with a cover of litter was 3 times that of those where litter was removed.

1287. DYRNESS, C. T., and YOUNGBERG, C. T. The effect of logging and slash-burning on soil structure. *Proc. Soil Sci. Soc. Amer.* 21 (4), 1957 (444–7). 7 refs. O.R.E.

A study on clear-felled sites on 3 reddish brown latosols in W. Oregon showed that only severe burning caused a significant deterioration of soil structure, particle size and organic-matter content (a 61% decrease), and as only ca. 8% of the area showed these symptoms, it is thought that high-lead logging with slash burning in autumn after rain has less injurious effect in the area studied than was previously assumed. *From authors' summary.*

1288. SARTZ, R. S. Influence of land use on time of soil freezing and thawing in the Northeast. *J. For.* 55 (10), 1957 (716–8).

A total of 56 plots was established in Maine, Mass., N.Y., and Pa. and each classified as (a) open land, (b) coniferous forest or (c) hardwood forest. During the two winters 1950–52 the dates of first and last frosts on each plot were recorded and the comparative times taken to freeze and thaw computed. Differences were observed between localities and sometimes in the same locality for the two years but, in general, concrete frost formed 3–47 days (mean 14 days) later in (b) and 26–48 days (mean 35 days) later in (c) than in (a). Thawing took place on (a) on an average 10 days sooner than on (b), and 5 days later than on (c). Reasons for the observed differences are not fully understood, but it is suggested that the amount of daily insolation during the heat-loss period may be an important factor influencing the time of freezing, and that the persistence of frost under (c) is due to the canopy intercepting solar energy.

1289. TYRTIKOV, A. P. Temperaturnyj režim počvy v različnyh rastitel'nyh soobščestvah v rajone Igarki. [Soil temperature regime in different plant communities in the Igarka region.] *Počvoved.* 1957 (6), (35–42). 17 refs. [Russ.e.] A.P.B.

Gives the results of soil temperature measurements to a depth of 15 cm. made at intervals from 15 July to 5 Sept. at Igarka [on the Yenisei R. inside the Arctic circle] under various types of plant cover: (1) treeless peat-bog; (2) open Spruce woodland with *Cladonia alpestris*; (3) open Larch with green mosses; (4) closed Larch with Alder understorey; (5) closed Larch with *Pleurozium schreberi*; (6) Alder scrub; (7) grass meadow; and (8) ploughed field. The mean temperature at 15 cm. varied from 1.5° C. for (1), through ca. 2–4.6° for (2)–(4), 5.6° for (6), to 9.4° for (7) and 10.3° for (8). The permafrost level in early Sept. varied correspondingly. The chief factor influencing soil temperature is depth of the peat layer, e.g. among the forest types, (5), with a 16-cm. peat layer, shows a mean of 1.9°, compared with 3.4° for (4), which had only 4 cm. of peat. Since tree growth in the extensive open woodlands of this region is limited mainly by soil temperature, measures for improvement should aim at promoting peat decomposition and destroying the moss cover (e.g. by herbicides).

#### 114.2. Soil Chemistry

See also Nos. 1292, 1295, 1297–8, 1304–5, 1620.

1290. LITWAK, M. The influence of *Tamarix aphylla* on soil composition in the Northern Negev



of Israel. *Bull. Res. Coun., Israel* 6D (1), 1957 (38-45). 8 refs. [E.]

Analyses of soil (total soluble salts, Cl, organic matter) (a) under the canopy and (b) in the open, show significantly higher values for (a), some of the differences holding for increasing soil depth and increasing with the age of the tree. Under a large crown the ground may be bare, the otherwise continuous ground cover changing at the crown margin to halophytes and ruderals. Under *Acacia cyanophylla* these soil and canopy effects are absent. Analyses of green shoots and litter of the Tamarisk are included.

1291. MARTIN, A. E., and REEVE, R. **Chemical studies on podzolic illuvial horizons. I. The extraction of organic matter by organic chelating agents. II. The use of acetylacetone as extractant of translocated organic matter.** *J. Soil Sci.* 8 (2), 1957 (268-86). 20 refs.

Soils studied were a New Zealand, ex-Kauri-forest dune sand, an iron-humus podzol from Scotland (*Erica/Calluna/Deschampsia*) and a sandy heath groundwater podzol from Tasmania.

**114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.**

See also Nos. 1286, 1290-1, 1304, 1309-15, 1474, 1711, 1719-21, 2093-5.

1292. WRIGHT, T. W. **Some effects of thinning on the soil of a Norway Spruce plantation.** *Forestry* 30 (2), 1957 (123-33). 21 refs.

Differences in the weight and nutrient content of the litter-fall collected at monthly intervals, and in some chemical and physical soil properties, have been studied in the replicated thinning plots of 45-year *Picea abies* at Bowmont Forest, Roxburghshire. The B-grade thinning is unusually light and results in increased litter-fall and accumulation of organic matter on the forest floor, but differences in litter-fall between the heavier grades are small; owing to changes in crown development. Thinning greatly increases the rate of breakdown of the forest floor and the amount of nutrients available per tree. The soil under the B-grade thinning contains more carbon, organic P and available Ca, but differences in more readily available forms of P and in available cations, other than Ca, are not significant. Leaching of K from the surface soil is more intense under the B-grade thinning. Of the physical properties studied, only the aggregation of the silt and clay is significantly affected by thinning, the heavier grades leading to a reduction in micro-aggregate stability. *From author's summary.*

1293. JACQUES-FÉLIX, H., and CHEZEAU. **Sur une relation entre le climat, le type de végétation et l'évolution d'un sol en zone intertropicale. [A relation between climate, vegetation type and soil evolution in the tropics.]** *Agron. trop.* 12 (5), 1957 (599-609). [F.f.e.span.]

Comparison of soil under (1) a 40-year plot of *Pinus khasya* and (2) a plot of mixed broadleaved species, in French Guinea, showed that, in spite of the depth of humus layer and slow decomposition of litter under (1), there was no sign of podzolization.

This is attributed to the long dry season in this region. The much wetter climate of the Ivory Coast can lead to podzolization under certain conditions.

1294. PERNET, R. **Influence de divers peuplements de reboisement sur la régénération des sols de Madagascar. [The effect of species or mixtures used in afforestation on soil regeneration in Madagascar.]** *Proceedings, 2nd Inter-african Soils Conference, Léopoldville 1954, 1955* (1115-8). [F.f.e.] O.R.E.

The formation and composition of an organic/mineral soil complex affecting soil structure, moisture retention and capacity for retaining exchangeable bases, were studied by a quick gravimetric method for ferrallitic soils on parent gneiss and supporting 20-year stands of native forest, or plantations of Pine, Eucalypt, *Acacia* and *Mangifera* and *Melia* spp., and on sites recently clear felled and burned. The most favourable soil development took place under *Melia* sp. and native forest; burning caused rapid soil degradation. Results of analyses are tabulated.

1295. GIULIMONDI, G., FUNICIELLO, M., and ARRU, G. M. **Ricerche sui terreni coltivati ad eucalitti. (I. Ricerche chimicofisiche.) [Investigations on soils under Eucalypts. (I. Chemical and physical studies.)]** *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (109-29 + 3 tpls.). 14 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

Studies were made of 11 profiles under Eucalypts (20-25 years old) on 4 sites (two in the Pontine district and two in Sardinia), and 10 on adjoining open land. The weight of humus accumulated in the A-horizons as a result of litter varied widely from one site to another (mean values 3.2, 3.5, 4.59, and 7 kg./sq. m.) and between profiles on the same site. Increase in N content of the surface layers was observed in only a few profiles, as a result of exceptional humus accumulation and in general it was higher on the controls under grass and legumes. Increase in P and K under Eucalypts was not proved, though it is considered probable, but there was an increase in availability of total exchangeable bases. The accumulation of humus was related to the chemical properties of the soils, and was found to be in inverse proportion to (1) the ratio of exchangeable bases, (2) the  $P_2O_5$  content, and especially (3) the content of free Fe oxide. Podzolization was of negligible proportions, and the possibility of chemical deterioration of the soil under Eucalypts, in the conditions of the investigation, is excluded. [Cf. F.A. 17 Nos. 3578-80, 3595; 18 No. 3650.]

1296. FLORENZANO, G. **Ricerche sui terreni coltivati ad eucalitti. (II. Ricerche microbiologiche e biochimiche.) [Investigations on soils under Eucalypts. (II. Microbiological and biochemical studies.)]** *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (131-52). 2 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

A study was made of the microflora of soils (a) under Eucalypts (20-25 years old) and (b) on adjacent open land on the same sites as the profile



studies [see preceding abstract]. Preliminary results are as follows: bacterial contents of (a) were generally lower than those of (b), but fungus populations were higher, with a remarkable abundance of actinomycetes. The composition as well as the abundance of the microflora was different in (a) and (b). The number of N-fixing bacteria was high in both (a) and (b), but ammonification, which developed regularly in (b), was reduced and variable in (a). Nitrifying bacteria were very scarce in (a) and much less active than in (b). Decomposition of cellulose by fungi was lower in (a). The soils investigated were sandy, with an acid humus layer, very permeable and exposed to leaching of bases. The organic matter of the litter proved to have an inhibiting effect on the soil microflora in the  $A_0$  and  $A_{00}$  horizons. In the  $A_0$  horizon biological activity depended largely on the C/N ratio. From a biological point of view, the (a) soils show no degradation, but they develop towards a kind of equilibrium different from that observed in (b) soils.

1297. DUCHAUFOR, P. L'action des divers types d'humus sur les processus d'entraînement dans le sol forestier. [The action of different types of humus on the processes of depletion of bases in forest soil.] *Rev. for. franç.* 9 (12), 1957 (887-97). 16 refs. [F.]

Discusses at length the processes involved: (1) mineralization, liberating  $CO_2$  and bases, (2) formation of soluble organic compounds, which favour the migration of clay, bases and sesquioxides; and (3) humification, with formation of insoluble humic compounds, retention of bases, and agglomeration of clay and iron in stable aggregates, and therefore preventing migration. The action of humus on the soil results from these processes: if (1) and (2) are stronger than (3), serious depletion of bases occurs, but this is prevented when (3) balances (1) and (2). This last case produces mull soils. A break in the cycle, due to e.g. clear felling, removal of litter etc., sets in action processes (1) and (2), and it is at this point that leaching becomes dangerous and leads to podzolization when the soil is already poor in bases. Suitable choice of species and liming may avert the danger. Podzolization is associated with N deficiency in the raw humus, which may contain a certain quantity of non-assimilable bases; what is necessary here is to accelerate biological activity by cultivation and chemical manuring.

1298. ŠILOVA, E. I., and KREJER, K. G. Uglekislota počvennogo rastvora i ee rol' v počvoobrazovanii. [The  $CO_2$  of the soil solution and its role in soil formation.] *Počvoved.* 1957 (7), (65-72). 17 refs. [Russ.e.] A.P.B.

Tabulates data on the pH, total titratable acidity, and contents of free  $CO_2$  and the  $HCO_3^-$  ion for the soil solution (withdrawn by a special device precluding contact with the external atmosphere) from various horizons of three podzolic soils near Leningrad, viz. well cultivated and slightly cultivated soils under perennial grasses, and a strongly podzolic soil under Spruce forest (*Oxalis* type). Data are also tabulated for the chemical properties of the soils

themselves. The author concludes that the  $CO_2$  regime, when the soil contains excessive moisture and diffusion of  $CO_2$  into the atmosphere is restricted, is one of the most important factors in the formation of such soils. When these were water-saturated, very high  $CO_2$  contents were observed in the soil solution, reaching 300 mg./litre. Values for free, active  $CO_2$  were high in the upper horizons but declined as sampling depth increased, with a corresponding rise in the values for  $CO_2$  in equilibrium with, or bound in, the  $HCO_3^-$  ion. This pattern is brought about by the low base content of the soil and the removal of bases from the upper horizons in the form of bicarbonates, which appear to be the chief form in which bases migrate to the lower levels. Total acidity of the soil solution was almost entirely due to the  $CO_2$  content. The well cultivated soil was the least acid, and was less acid in the upper horizons than in the lower; it had the highest base content and its soil solution in autumn showed unusually high values for  $SO_4$  and Cl. It is urged that any measures reducing excess moisture and promoting diffusion of  $CO_2$  into the atmosphere, may be expected to be beneficial.

1299. TAMM, C. O. Ett exempel på markprofilbildningen i gamla kolbotttnar. [An example of soil profile development on old charcoal-burning sites.] *Svenska Skogsväsen. Tidskr.* 55 (5), 1957 (505-14). 14 refs. [Sw.e.]

Compares normal profiles in poor Pine forest with adjacent ones where charcoal burning had been done ca. 100-300 years earlier. The latter are characterized by the old soil profile, recognizable under a layer of mixed soil with visible podzolization. The buried profiled suffer from normal ones in the absence of the dark-brown colour of the  $B_1$  horizon and a lower humus content in all horizons.

#### 114.4. Soil Classification. Soil Types

See also Nos. 1291, 1474, 1513, 1518, 1535, 1553, 1537.

1300. TATARINOV, S. F. Podzolistye počvy Arhangel'skoj oblasti. [Podzolic soils of the Archangel region.] *Počvoved.* 1957 (7), (13-21). 19 refs. [Russ.e.] A.P.B.

The podzolic soils of this region are held to constitute a district soil 'province'. Three main types are described: typical, humus, and gley podzols. Soil formation in this region is determined by the cover of mossy Spruce forests, the litter of which is rich in Al and exchangeable H, with a high acidity and very low contents of Ca and Mg. The moist climate favours gley formation.

1301. BABOS, I. Homoki termöhelylancok. [Site catena on sandy soils.] *Erdész. Kutatás., Budapest* 1956 (4), (33-98). 22 refs. [Hu.hu.russ.e.g.]

Choice of species in the planning of afforestation, hitherto based on plant associations and some soil profiles, has been speeded up (detailed planning of 2300 ha, in 2 months) by the recognition of catenas (based on wind direction, slope and aspect) in the sandy areas of Hungary. The regular 4-linked catena is (a) the windward slope, 10-16°; (b) the leeward slope, 20-30°; (c) its basal depression; and



(d) the flattish area beyond, covered by wind-blown sand. These catenal areas are further grouped into 6 sand regions based on the depth of sand and the relative height, configuration and steepness of the dunes. The reforestation of (a) is difficult. The wind-scoured ridge (indicator *Fumana vulgaris*) is often unfavourable; (b) carries Poplar/Juniper with *Crataegus*, and is favourable to the planting of these tree species, but the depression (c) should be planted first to protect them from the sun. Under (d) lies the original soil, and choice of species depends on the height of the water-table; hollows, where the soil is not degraded, should be planted first to give side shelter to neighbouring areas. Hollows, reentrants etc. of (b), require careful choice of species. [Cf. *F.A.* 19 No. 1702.]

1302. MITCHELL, W. A., and İRMAK, A. **Turkish forest soils.** *J. Soil Sci.* 8 (2), 1957 (184-92). 7 refs.

The distribution and composition of the forests is given with analyses of 16 soils (brown earth, brown-earth podzols, terra rossa, chernozem and rendzina). The generally extreme climatic variations and low rainfall are aggravated by erosion following clearance. The mineral composition of the clay fraction is discussed in reference to soil type, parent material, cation exchange capacity, drainage and productivity.

1303. MAGNANINI, A. A presença de lateritos nas regiões florestais do Brasil. [The presence of laterites in the forest regions of Brazil.] *Brasil madeireiro* 12 (120), 1957 (19-25). 40 refs. [Port.]

Discusses the definition of the term laterite, reviews and discusses literature dealing with its existence in the forest regions of Brazil, and briefly recommends the course of future studies on this subject.

#### 114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 1276, 1342, 1472-4, 1535, 1553-4, 1868-9, 2093-4, 2134-8.

1304. ARRHENIUS, O. **Plant food from decayed leaves and conifer needles.** *Acta Agriculturae Scandinavica, Stockholm* 7 (4), 1957 (321-40). 18 refs. [E.e.]

In recent experiments the author has found relationships (shown here in graphs) between the conductivity of the soil solution and the productivity of forest soils, and between the salt content of the groundwater and the yield of winter wheat in S. Sweden. In laboratory experiments, monthly analyses were made, for some 12 months, of water that had been allowed to percolate through leaves of different tree species, gathered from the tree or collected after leaf-fall. Results are shown in graphs and tables. The extracts from the deciduous leaves showed the highest amounts of K, Ca, Mg, N and  $PO_4$  and those from conifer needles the highest amounts of Mn and Fe. Extracts of both fresh and fallen Elm leaves had high contents of K, Ca, Mg, N, and Birch had the highest content of  $PO_4$ . The concentration of nutrients in the soil-water extracts from Spruce litter is probably too low for satisfactory growth of young trees.

1305. **Toxicity to plants of arsenic in soil. References 1931 to date.** *Science Library Bibliographical Series, Science Museum, London* No. 753, [1957?] pp. 2. 44 refs.

#### 114.6. Soil Biology

See also Nos. 1296, 1719-20, 1926, 1948, 2005, 2304, 1306. **Estimation of fungal activity in soils.** *Rep. Nat. Conservancy, Lond.* 1956/57, 1957 (13).

Studies of woodland ecology have been strengthened by the establishment at Merlewood of a Microflora Section. Its work is at present mainly concerned with the fungi of soil and litter. The estimation of fungal numbers in soil presents many difficulties, and a technique being developed to meet this problem is based on the use of nylon gauze, a biologically inert material which, when buried in soil, becomes colonized by living fungal filaments. The grid formed by the meshwork of the gauze facilitates the microscopic counting of the fungal filaments. Laboratory experiments have demonstrated the sequence of events that follow the insertion of nylon 'grids' in soil. First there is a lag phase, followed by a period of active colonization, after which the population remains fairly static and is probably influenced by the activities of various soil organisms. The duration of the lag phase has been found to vary with soil conditions, which suggests that it may provide a useful index of fungal activity in various soil types. The static phase is tentatively regarded as being related to the general level of the population of the soil. Preliminary results with field soils indicate that filament numbers are regulated by the type of soil and vegetation and the temperature and moisture regimes of the soil as well as by the activity of soil bacteria and animals.

1307. BROUWERS, L. Mesure de l'activité protéolytique et ammonifiante du sol. [Methods of estimating [1] the proteolytic and [2] the ammonifying activity of soils.] *Bull. Inst. agron. Gembloux* 25 (1/2), 1957 (38-43). 1 ref. [F.] E.M.B.

(1) A gelatine solution is inoculated with a given quantity of the soil and after a period of incubation the degree of hydrolysis of the gelatine is measured by formal titration. (2) A solution of an amino acid is inoculated with a certain quantity of soil, and after incubation the degree of decomposition of the amino acid is measured by formal titration.

Some results are given of the use of these methods to compare soils under hardwoods and conifers, and agricultural and garden soils.

1308. ORDIN, A. P. Vlijanie rastitel'nosti na sostav mikoflory počvy. [The influence of vegetation on the composition of the soil mycoflora.] *Izv. Akad. Nauk SSR (Ser. biol.)* 1957 (4), (495-502). 21 refs. [Russ.] A.P.B.

In 1952/53 studies were made in the Kamennaya Steppe of the fungus flora to a maximum depth of 80 cm. in chernozems under (a) natural steppe vegetation, (b) a 55-year Oak shelterbelt, and under agricultural crop rotation either (c) on the open steppe or (d) surrounded by shelterbelts. An area of solonets soil (e) was also studied. Results are tabulated. Relatively high populations of *Penicillium* and *Trichoderma* were found for (a) and (b); in



the A<sub>0</sub> horizons of (b), these were the dominant fungi, but in the A<sub>0</sub> horizons of (a) *Mucor*, *Rhizopus*, *Fusarium*, *Cladosporium*, *Phoma* and *Chaetomium* were also abundant. For (e) the characteristic fungi were *Aspergillus* and *Fusarium*. The cultivated soils (c) and (d) showed greater numbers of genera and species, and were characterized by abundance of *Fusarium*, *Aspergillus*, *Rhizopus*, *Alternaria*, *Cladosporium* and *Chaetomium*. The influence of the shelterbelts round (d) was shown in the greater numbers of the species *Aspergillus wentii*, *Alternaria tenuis*, *Penicillium restrictum*, *Scopulariopsis* sp. and *Gliocladium* sp.

1309. SAITÔ, T. **Microbiological decomposition of Beech litter.** *Ecological Review, Sendai* 14 (2), 1956 (141-7). 10 refs. [E.e.] O.B.D.

An account of the microflora and microbiological decomposition of Beech litter in a stand on the south-facing slope of Mount Hakkôda in Aomori Prefecture, Honshu. The litter profile may be divided into several horizons. In the upper ones, overlain by undecomposed fallen leaves, the leaves turn partly yellowish and are heavily infected with basidiomycetous mycelia associated with a vigorous growth of bacteria. The leaves became thinner without at first losing their structure. In the lower horizons, where decomposition is much more advanced, bacteria and actinomycetes are less numerous but fungi tend to increase. Apart from the above-mentioned basidiomycetes, filamentous fungi and actinomycetes are on the whole less numerous than the bacteria. A few species of *Penicillium*, *Absidia glauca*, *Mucor ramannianus* and *Trichoderma viride* are widespread. Much CO<sub>2</sub> is produced in the horizon that is rich in bacteria and basidiomycetes. *From author's summary.*

1310. NOŠEK, J., and AMBROŽ, Z. La faune du sol et l'activité microbienne du sol forestier. [Soil fauna and microbial activity of forest soils.] *Schweiz. Z. Forstw.* 108 (10/11), 1957 (557-70 + 8 photos). 5 refs. [F.f.g.]

Describes and discusses analyses of microflora and soil fauna from 4 sample plots in Mjonši National Park, Beskid Mts., Czechoslovakia, 3 on brown forest soils in an *Abieto-Fagetum* and a *Fagetum*, and one on a humus podzol in a *Piceetum*. Climatic, vegetation and soil data are also given, and soil-fauna analyses of 5 plots in a degraded *Querceto-Carpinetum* in the 'forest-steppe' region near Plášťovce are presented for comparison. The numerical composition of the microflora concerned in the N and C cycles and in the breakdown of cellulose, lignin, pectin, and humous substances was investigated. Biological activity of the soil corresponded fairly closely to the density of the acarine and nematode fauna. It was much greater in the brown forest soils than in the podzol. Marked differences in numbers and composition of fauna and microflora occurred in spring and autumn. Generally a state of dynamic equilibrium could be said to exist between them and the vegetation. In the 'forest-steppe' region acarine and apterygote populations were high on some plots, but very low in plots covered with *Festuca* spp. or bryophytes.

1311. MIKOLA, P., and HINTIKKA, V. **The development of a microbial population in decomposing forest litter: a laboratory study.** *Commun. Inst. for. Fenn.* 46 (5), 1956 (1957). pp. 15. [E.f.]

Experiments were made with five kinds of air-dry litter—(1) *Hylocomium* moss, (2) *Deschampsia flexuosa*, (3) *Alnus incana*, (4) *Populus tremula*, (5) *Pinus sylvestris*—in order to determine how far a natural bacterial population, taken from the humus and litter of a mixed stand, changes when grown on different forest litters. A striking result was on the one hand, the very large number of bacteria in all types of litter and, on the other, the very limited number of species to which they belonged. In (2) and (4) they increased rapidly, in (5) they started high and decreased continuously, in (1) and (3) they increased slowly. The experimental technique favoured rapidly growing and richly sporulating moulds at the expense of non-sporulating *Mycelia sterila* and higher ascomycetes and basidiomycetes, but some conclusions can be drawn. Sporulating moulds are very abundant in forest soil. They play an essential role in the decomposition of litter, mainly during the early stages, other fungi and bacteria attaining more importance later on. These changes in the microflora are correlated with changes in the litter itself. The course of the pH of litter during decomposition was traced and it was found that the change in the microflora was greatest in those litters, (3) and (4), in which pH rose highest, and least in those that remained more acid, (1) and (5). Anaerobic conditions were not studied, but in semi-anaerobic conditions decomposition was slower and changes in pH smaller.

1312. Levensgemeenschappen van de bodem. [Communities in the soil.] *Meded. Inst. toegep. biol. Onderz. Nat.* No. 31, 1957 (8-12). [Du.]

Periodic litter analyses were made in 3 forest types: (1) Oak/Alder forest with a very varied undergrowth, rapid litter decomposition, and topsoil with a high pH; (2) Oak/Birch forest with a rich herb layer, rapid litter decomposition, but a topsoil poor in Ca; (3) a normal Oak/Birch forest with a herb layer poor in species, slow litter decomposition, and a low pH. The number of fungus species increased from (1) to (3). Type (1) was rich in worm species and (2) in *Enoicyla pusillus*. Cellulose-attacking bacteria were absent from the most acid soil but present in the other two; cellulose-attacking fungi and actinomycetes were present in all types. CO<sub>2</sub> production per unit area and per g. of dry matter varied with the soil type, values being 6 : 3 : 4 and 3 : 2 : 10 respectively for types 1, 2 and 3. The upper litter layer produced more CO<sub>2</sub> than the lower ones, and Alder and Poplar litter 3-4 times as much as that of Birch and Oak. The CO<sub>2</sub> production of Oak litter could be stimulated with leaf extracts of other species. Results of laboratory experiments on cultural conditions for *Lumbricus rubellus* are discussed. In old Oak litter this species showed an immediate increase in weight, an increase delayed for some months on fresh litter, but greater once it occurred. Stable manure plus Alder litter gave a large weight increase, soon



followed by death of the worms. *Prunus* litter gave a gradual increase to 260% of the original weight. Oak, Beech and Robinia litter caused a loss in weight and the worms died at 30–50% of their original weight. Scots Pine litter from plots used in liming tests gave different results according to the soil treatment, but generally led finally to loss of weight and death. In areas where *Deschampsia flexuosa* had been treated with Na dichloropropionic acid or Na trichloracetate at varying rates at the end of May, there was little direct effect on the soil fauna, although some species declined because of consequent changes in the vegetation.

1313. NEF, L. État actuel des connaissances sur le rôle des animaux dans la décomposition des litières de forêts. [The present state of our knowledge regarding the role of the [soil] fauna in the decomposition of forest litter.] Repr. from *Agricultura, Louvain (Sér. 2)* 5 (3), 1957 (245–316). 163 refs. [F.f.d.u.e.g.]

A review of world literature, covering quantitative estimates for each group from protozoa to vertebrates, discussing methods and reliability of estimates and, for most groups, food preferences, metabolism, their role in the physical and chemical processes of humus formation and the N cycle, the interaction of the groups with each other and with fungal or bacterial micro-organisms, and the influence of environmental factors, particularly vegetation, microclimate, and the chemical composition of the soil. A table, compiled from data in the literature, compares for a soil under conifers and one under hardwoods mean values for quantity, weight and respiration of the various faunal groups. It is suggested that the annual respiration postulates metabolic activity requiring annually an amount of organic matter approximating to the annual fall of litter and plant debris. The influence of the soil fauna is exerted by: (1) the fragmentation and mixing of plant debris, facilitating the action of the microflora which perform most of the chemical changes involved in humification and mineralization; (2) the chemical changes occurring in their intestines; and (3) their differential effects on micro-organisms, e.g. favourable to *Azotobacter* and inhibitory to mineralizing organisms. Finally, the possible uses of soil-fauna studies for the classification of soils, the detection of incipient changes in the soil, and for soil amelioration are discussed and lines of research suggested.

1314. Successional changes in litter breakdown. Rep. Nat. Conservancy, Lond. 1956/57, 1957 (12–3).

Samples of Oak and Ash leaves of known air-dry weight were enclosed in nylon hair-nets and placed on the ground in sample areas on (a) a mull, (b) a mor type of humus. Ash leaves decomposed much more rapidly than Oak, and after 8 months had almost disappeared on (a), whereas Oak leaves and bracken rachides had lost only ca.  $\frac{1}{5}$  of their initial dry weight. Ash litter decomposing on (a) showed little change in content of N per unit dry weight, but on (b) showed an increase of 65% in 6 months. The difference is consistent with the hypothesis that the major loss of organic matter from Ash litter on

(a) is due to the larger litter-feeding animals, whereas on (b) it is due mainly to solution or gaseous evolution of compounds rich in C but very poor in N.

1315. GILJAROV, M. S. Kivsjaki (Juloidea) i ih rol' v počvoobrazovanii. [Millipedes and their importance in soil formation.] *Počvoved*, 1957 (6), (74–80). 20 refs. [Russ.e.] A.P.B.

Studies were made in the Derkul river basin on chernozems under steppe vegetation (grass and shrubs) or 50-year shelterbelt plantations of Oak/Ash, and on dark-grey forest soils under natural Oak/Ash. The 3 predominating species of millipedes were *Chromatojulus rossicus*, *C. kievensis* and *Sarmatiulus kessleri*. The millipede population was lowest on virgin flat grass-steppe; it was considerably higher under the tree plantations than under natural woods, *S. kessleri* being particularly numerous (ca. 150/sq. m.), a fact ascribed to the higher Ca content of the chernozems compared with the grey forest soils. *S. kessleri* was also very numerous in steppe depressions and ravines with shrubs such as *Caragana frutex*, *Prunus spinosa* and *Amygdalus nana*. Chemical analyses of *S. kessleri* showed that its ash composition differed from that of the litter in having considerably higher contents of  $\text{Fe}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$  and especially CaO. It is concluded that millipedes are important in soil formation, their activity helping to decompose and humify the litter and to enrich the top horizons with CaO. [Cf. F.A. 17 No. 56.]

1316. STEVANOVIĆ, D. Naselje Collembola šumskih asocijacija na Kopaoniku. [Populations of Collembola in forest associations on Mt. Kopaonik.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 7 (4), 1956, pp. 16. 17 refs. [Serb.e.]

Gives data on the species composition (29 in all) and population density of Collembola from studies made in 1953–54 in the forest types *Quercetum montanum*, *Fageto-Luzuletum pauperum* and *Piceetum excelsae*.

#### 116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 1286, 1288, 1350, 1535, 1699–1704, 1707–9, 1764, 1887.

1317. MINER, N. H., and TRAPPE, J. M. Snow interception, accumulation, and melt in Lodgepole Pine forests in the Blue Mountains of eastern Oregon. *Res. Note Pacif. Northwest For. Range Exp. Sta.* No. 153, 1957. pp. 4. 1 ref.

1318. SATO, T., et al. [Some measurements by new type of mountain infiltrometer. (2).] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 99, 1957 (25–57 + 51 photos). 21 refs. [Jap.jap.e.e.]

Further investigates the use of apparatus already described [see F.A. 18 No. 1255] on 51 sites described in detail. The data cover the number of plots required to give differences in infiltration of 10, 20 and 30 mm./hour between sample and population means for a single complex under forest and bare land; comparison of infiltration capacity under different covers; relation between infiltration capacity and rainfall intensity; and between the capacity and gradient, the last supported by apparatus for varying the gradient in laboratory experiments.



1319. [Watershed management study.] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 7, 1956. pp. [5] + 189 + 13 photos, 2 maps. 38 refs. [Jap.jap.e.e.]

Parts I and II are detailed studies of erosion and water relations against the background of vegetation, soils, climate and weather in the Soukkyo and Hidaka districts. In the former, the effects of the 1954 Typhoon 'Marie' and, in the latter, the heavy rains of July 1955, are specially examined. The typhoon, the most intense experienced in Hokkaido, blew down  $8.8 \times 10^9$  bd. ft. of timber. Part III compares, from 14 years' data, mean precipitation and run-off in conifer/hardwood forests before and after exploitation began in 4 catchments of the Kamikawa Experimental Forest. Part IV (M. Ishikawa) compares the infiltration index and the amount of eroded soil as measured by infiltrometer, in a Larch stand and on bare land.

1320. TROEDSSON, T. Bidrag till kännedom om ytavrinningsen omfattning i skogsmarken. [The extent of run-off in forest soils.] *Svenska Skogsv-Fören. Tidskr.* 55 (5), 1957 (515-22). 11 refs. [Sw.]

Measurements were made on 6 plots in Spruce, Pine and mixed conifer stands on a moraine soil in Kratte-Masugn forest district, Gävleborg county. The vegetation, soil, and slope of each plot are described. The apparatus used (illustrated) consisted of a wooden frame,  $2 \times 0.5$  m., set 10 cm. into the soil and having a metal pipe at the lower end to carry the run-off into a container. Results are tabulated. The total run-off collected ranged from 0 to 40 mm. for the different plots between 1 May and 1 Oct. 1956 and from 30 to 75 mm. for the same period in 1957, representing 0-13.8% and 5.3-13.3% of the total rainfall (290 and 565 mm. respectively) for the two periods. Figures are discussed and compared with some from Hilchenbach, W. Germany, where totals in 1951-54 ranged from 25 to 62 mm., and % values from 5.5 to 9.1%; rainfall amounts were considerably higher than those for Sweden.

1321. Land use surveys. *Rep. For. Dep. Tanganyika* 1956, 1957 (6).

An examination of the northern and western slopes of Kilimanjaro suggested that some of the forests on the lower slopes did not exercise a protective function, as was at one time believed, because the very deep layer of volcanic ash upon which they grew allowed much, if not all water to percolate to a great depth and emerge at distant points on the plain below. During the examination, diminution of stream flow and, in some cases, actual disappearance of streams was observed. From a forest-management point of view, therefore, it became apparent that above the theoretical line of stream diminution or disappearance, the forest was fully protective in function and required to be retained intact at all costs, while below the line it was capable of normal productive development. An attempt is now being made to convert the theoretical line to a line on the ground.

1322. CAVESTANY Y DE ANDUAGA, R. [Editor]. Servicio de Explotación y Mejora de las zonas áridas del sudeste español. Memoria—resumen de los

trabajos realizados desde su creación, 9 enero 1953, hasta 31 marzo 1956. [Service for the exploitation and improvement of the arid zones of southeastern Spain. Report and summary of the work accomplished since its creation 9th January, 1953 until 31st March, 1956.] Ministerio de Agricultura, Madrid. [1956?] pp. 61. [Span.]

Presents a report on the area planted with Prickly Pear and forage species, measures taken for erosion control, and the establishment of plantations and shelterbelts, particularly of Eucalypts, *Pinus pinea* and *P. radiata*, and of guayule plantations.

1323. BULLARD, W. E., LUCA, P. DE, and MESSINES, J. Rapport au Gouvernement de la Yougoslavie sur l'aménagement des bassins de réception et le contrôle de l'érosion des sols. [Report to the Government of Yugoslavia on the management of catchment areas and erosion control.] Extended Technical Assistance Programme, FAO, Rome. *FAO Report* No. 657, 1957. pp. 92 + 4 maps, 2 photos. [F.] Limited distribution.

1324. YAMANLAR, O. Sille, Altınapa, May v Ayrancı baraj havzalarında vuku bulan toprak erozyonu ve buna karşı alınacak tedbirler üzerinde araştırmalar. [Studies in soil erosion control on the catchment areas of the Sille, Altınapa, May and Ayrancı dams [Turkey].] TC Nafia Vekâleti, Devlet Su İşleri Umum Müdürlüğü, Neşriyatı, Ankara. 1957. pp. 35 + 7 maps. [Turk.]

A detailed, illustrated report on these catchments, totalling nearly 330,000 ha., including descriptions of their original and present forest cover and of the agencies that have ruined it, notably excessive numbers of cattle and bad cultivation practices. Recommendations for control are made.

1325. YAMANLAR, O. Fırat nehri yağış havzasında vuku bulan toprak erozyonu ve Keban barajının siltasyondan korunması imkânları na dair etütler. [Studies in soil erosion control in the [upper] Euphrates basin to reduce siltation of the Keban dam.] TC Elektrik İşleri Etüd İdaresi Genel Direktörlüğü, Ankara. 1957. pp. 24 + 1 tbl., 81 photos, 6 maps. [Turk.]

A detailed, illustrated report on the area, including descriptions of its original and present forest cover (4%), assessments of erosion, and coloured maps of present and proposed land use.

1326. YAMANLAR, O. Kızılırmak nehri yağış havası yukarı muntıklarında vuku bulan toprak erozyonu ve Hirfanlı barajının siltasyondan korunması imkânlarına dair etütler. [Studies in soil erosion control on the upper Kızılırmak [river] to reduce siltation of the Hirfanlı dam [Turkey].] TC Elektrik İşleri Etüd İdaresi Genel Direktörlüğü, Ankara. 1957. pp. 23 + 1 tbl., 64 photos, 3 maps, 1 dgm. [Turk.]

A detailed, illustrated report on the area, only 10% of which now carries any forest and 85% is barren, with a map of present land use and recommendations for control.

1327. GORRIE, R. M. Report to the Government of India on soil conservation. Expanded Technical



Assistance Program, FAO, Rome. *FAO Report* No. 680, 1957. pp. 16. Limited distribution.

1328. COSTIN, A. B. **High mountain catchments in Victoria in relation to land use.** Victoria Soil Conservation Authority, Melbourne. 1957. pp. 85 + 2 maps.

Deals mainly with the deterioration of vegetative cover (particularly woodland and bogs) and consequent erosion, largely due to burning and overgrazing.

#### 14. Systematic Zoology

##### 145.7. Insecta. Entomology

See also Nos. 2001 *et seq.*, 2451 *et seq.*

1329. STEINHAUS, E. A., and SMITH, R. F. [Editors]. **Annual Review of Entomology. Vol. 2.** Annual Reviews Inc., Palo Alto, Calif. 1957. pp. 407. Many refs. Price \$7.50 (60s.).

Includes the following reviews of literature among others: Cytogenetics and systematic entomology (M. J. D. White); Dynamics of insect populations (M. E. Solomon); The synoptic approach to studies of insects and climate (W. G. Wellington); Insect migration (C. B. Williams); Genetics of insect resistance to chemicals (J. F. Crow); Mode of action of insecticides: (1) exclusive of organic phosphorus compounds (P. A. Dahn), (2) organophosphorus (E. Y. Spencer and R. D. O'Brien); The behaviour of systemic insecticides applied to plants (S. H. Bennett); Aerial application of insecticides (F. E. Weick and G. A. Roth); Insecticidal control of the spread of plant viruses (L. Broadbent).

1330. WOODROFFE, G. E. **A preliminary revision of the British *Psallus* Fieber [s.l.] (Hem., Miridae), with a description of a new species.** *Ent. mon. Mag.* 93 (1122-3), 1957 (258-71). 10 refs.

Includes a description and figure of *Psallus masseei* sp. nov., probably from *Quercus* sp.

1331. SINGH, B. **Description and systematic position of larva and pupa of the Teak defoliator, *Hyblaea puera* Cramer (Insecta, Lepidoptera, Hyblaeidae).** *Indian For. Rec. (n.s.) Entomology* 9 (1), 1955 (1956), (1-16). 13 refs. Price Rs.1 (1s. 6d.).

The study justifies the erection of the family Hyblaeidae for the genus *Hyblaea*, and its separation from the Noctuidae.

1332. PALM, T. **Bidrag till kännedom om svenska skalbaggars biologi och systematik. 20. *Rhopalopus femoratus* L. (Cerambycidae). 21. Larverna till våra *Exocentrus*-arter (Cerambycidae). 22. *Rhagium*-larverna med särskild hänsyn till *sycophanta* Schrank (Cerambycidae). [Biology and taxonomy of Swedish Coleoptera. 20. *R. femoratus*. 21. The larvae of Swedish *Exocentrus* spp. 22. The larvae of *Rhagium* especially *R. sycophanta*.]** *Entomologisk Tidskrift, Stockholm* 78 (1), 1957 (48-55). 11 refs. [Sw.g.] O.R.S.

1333. DUFFY, E. A. J. **A monograph of the immature stages of African timber beetles (Cerambycidae).** British Museum (Natural History), London. 1957. pp. vii + 338 + 10 plates. 19 pp. of refs. Price £5. 5s.

[Cf. F.A. 15 No. 862.] Includes keys to larvae (137 genera, 203 species) and pupae (61 genera, 83 species), description and bionomics of the immature stages, and a catalogue of host plants.

1334. MATHUR, R. N. **Immature stages of Indian Coleoptera (28) Anthribidae.** *Indian For. Rec. (n.s.) Entomology* 9 (5), 1956 (1957), (127-9 + 1 plate). 1 ref. Price Rs.0.44 (8d.).

The larval and pupal characters of *Autotropis modesta modesta* are described in some detail, with illustrations. It was found infesting a partly dead Teak stump in the Andamans.

1335. GARDNER, J. C. M. **Note on two beetle species in an Acacia tree.** *Emp. For. Rev.* 36 (3), 1957 (292-4).

A curious structure (perhaps to facilitate extrusion of frass) in the gallery of a platypodid, *Doliopygus subditivus*, and the pupal chambers of a weevil, *Scoliproctus schaumii*, are figured and briefly described. Both occurred in the butt of a dead tree of *Acacia* sp. in Kenya. Twelve species of weevil have been collected of recent years and in each case platypodids of about the same width were taken from the same wood, and this seems to be more than coincidental.

1336. GRAHAM, M. W. R. DE V. **A revision of the Walker types of Pteromalidae (Hym., Chalcidoidea). Part 3 (including descriptions of new species).** *Ent. mon. Mag.* 93 (1121), 1957 (217-36). 17 refs.

Includes gall-forming, forest-seed-eating, and parasitic species.

#### 15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 1744, 1982 *et seq.*, 2014, 2572-6, 2586.

1337. STENLUND, M. H. **A field study of the timber wolf (*Canis lupus*) on the Superior National Forest, Minnesota.** *Tech. Bull. Minn. Dep. Conserv.* No. 4, 1955. pp. 55 + map. 67 refs.

A study to determine the extent to which predation by wolves affects game animals and birds.

1338. MARTIN, P. W. **Wildlife management and forest use in Central British Columbia.** *For. Chron.* 33 (3), 1957 (205-7).

1339. MÖHRING, G. **Die Beerenäsung unseres Federwildes. [Berries in game-bird nutrition.]** *Arch. Forstw.* 6 (5/6), 1957 (330-42). 41 refs. [G.g.russ.e.]

Lists 71 plants, the months in which their fruit ripens, the birds feeding on them, and the countries in which they occur. Fruit scarcity from March to early July, when coincident with a poor insect year, must often explain a scarcity of birds. Planting in hedge and forest (but not by road- or rail-side) is recommended for a year-round supply.

1340. EYGENRAAM, J. A. **Über die Behandlung des Birkhühnerbestandes. [The management of black grouse populations.]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 29, 1957. pp. [9]. 6 refs. [G.g.e.f.]

Includes tables showing food plants, and recommendations on providing suitable habitats as



regards food (including Birch, Pine, Oak and Willow buds), roosting places, nests etc.

1341. WURTZ, A. Action des feuilles de peuplier dans de petits bassins de pisciculture. [The effect of Poplar leaves on small fishponds.] *Bulletin Français de Pisciculture*, Paris 28 (179), 1955 (41-52). [F.f.] L.S.

Describes experiments in which ca. 300 kg. of Poplar leaves, dead or fresh according to season, were thrown into one of two fishponds of 504 sq.m., 0.5-1m. deep, over a period of 18 months. While no marked differences were found in the chemical properties of water, nor in plankton or higher aquatic plants, the leaves had resulted in the formation of a thick, malodorous layer of putrefying mud which had adversely affected the ground fauna and the conditions favouring fish reproduction. The weight of the fry (tench and roach) raised in this pond was 10 kg. against 27 kg. in the control pond. Similar observations on the formation of putrefying mud (undetectable by water analysis) on the bottom of ponds or basins, including basins with clear, running water, caused or accelerated by Poplar leaves shed from trees on their banks, support the conclusion that such leaves are harmful to the rearing of fish.

## 16. General Botany

### 160. Plant Chemistry

See also Nos. 1290, 1473, 1475, 1727-8, 1762, 1780-1, 1868-70, 1875-6, 2138, 2302 *et seq.*, 2516 *et seq.*

1342. [N content of the needles of Douglas Fir.] *Korte Meded. Bosbouwproefsta., T.N.O., Wageningen* No. 30, 1957 (8-9). [Du.]

No direct relationship was found between chemical composition of the needles and of the soil. The relative P content of the needles generally decreases and the N content increases with increasing P content of the soil. In normally developed trees N content of the needles is also closely related to the length of the annual shoot. Within a given soil type a close relationship exists between 100-needle weight and their N content, and the better the soil type the higher the N content for the same 100-needle weight. Plantations protected from direct sunlight by adjoining stands in winter showed better growth and needle colour, and higher N content of needles, than unprotected ones. The poorer the soil, the lower is the N content of needles and the greater the susceptibility to direct exposure to winter sun. On the basis of these results, strip systems of felling are preferable to shelterwood or clear felling.

1343. Laboratorio General de Química Forestal. Pigmentos vegetales. [General laboratory of forest chemistry. Vegetable pigments.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (79). [Span.]

Gives results of analyses of leaves of 5 coniferous and 2 broadleaved species for chlorophyll, xanthophyll and carotene.

1344. WALL, M. E., *et al.* Steroidal sapogenins XLIII. Survey of plants for steroidal sapogenins and other constituents. *J. Amer. pharm. Ass. (sci. Ed.)* 46 (11), 1957 (653-84). 12 refs.

Data are tabulated for 950 samples representing 272 genera and 432 species. Trees and shrubs include: *Acer negundo* and *A. rubrum*, *Schinopsis lorentzii*, *Ilex* spp., *Alnus serrulata*, *Casuarina* spp., *Terminalia* spp., *Quercus* spp., *Liquidambar styraciflua*, *Aesculus* spp., *Acacia* spp., *Robinia pseudo-acacia*, *Ficus* spp., *Eucalyptus* spp., *Cupressus* spp., *Pinus* spp., *Rhizophora mangle*, and *Ailanthus altissima*. Other constituents studied were saponins, flavonoids, alkaloids, tannins and unsaturated sterols.

1345. ROUX, D. G. Some recent advances in the identification of leuco-anthocyanins and the chemistry of condensed tannins. *Nature, Lond.* 180 (4593), 1957 (973-5). 22 refs.

A review of literature, dealing largely with *Acacia* spp.

1346. RANGASWAMI, S., and SAMBAMURTHY, K. Crystalline chemical components of the leaves of *Rhododendron falconeri* Hook. *Proc. Indian Acad. Sci.* 46A (3), 1957 (245-9). 9 refs. O.R.S.

Three crystalline substances, apparently triterpene in nature, were obtained from the petroleum/ether extract of the leaves in very low yield. From the ether extract, ursolic acid was obtained and from the alcoholic extract, quercetin. *From authors' summary.*

1347. NILSSON, M., RYHAGE, R., and SYDOW, E. VON. Constituents of pollen. II. Long-chain hydrocarbons and alcohols. *Acta chem. scand.* 11 (4), 1957 (634-9). 18 refs. [E.e.] O.R.S.

Some waxy crystalline fractions isolated from pollen have been investigated by mass spectrometry. This method has proved convenient in investigating mixtures of long-chain natural products. Pollen of *Pinus mugo* contains *n*-tetracosanol-1, *n*-hexacosanol-1, and *n*-octacosanol-1; that of *Zea mays* and *Alnus glutinosa* contains paraffins—maize *n*-pentacosane and *n*-heptacosane, and Alder mainly *n*-heptacosane and *n*-nonacosane. [Cf. F.A. 18 No. 80.] *From authors' summary.*

### 161. Physiology

See also Nos. 1467 *et seq.*, 1780-1, 1896, 1923-5.

1348. POGREBNYAK [POGREBNJAK], P. Tracer atoms in forestry research. *Indian For.* 83 (9), 1957 (549-50).

A note on research at the Forestry Institute of the Ukrainian Academy of Sciences, particularly on the interrelationship of species in mixtures. It was found, e.g. that *Fraxinus excelsior* takes up P much more rapidly than *Quercus robur*, and it is concluded that on soils poor in P, the Ash is undesirable in Oak plantations.

1349. CEL'NIKER, JU. L. Vlijanie vlažnosti obyknovennogo černozema na transpiraciju drevesnyh porod. [The influence of the moisture content of ordinary chernozems on the transpiration of tree species.] *Počvoved.* 1957 (5), (54-62). 33 refs. [Russ.] A.P.B.

The influence of soil moisture (s.m.) on transpiration is discussed in detail on the basis of Ivanov's data on transpiration rates in the Derkul forest,



Zonn's data on soil moisture, and additional studies by the author in 1950-55 on 8 ha. of 19- to 20-year stands of *Quercus robur*, *Fraxinus excelsior*, and *F. pennsylvanica*. The correlation ratios ( $\eta$ ) of transpiration with total s.m. to depths of 50 and 200 cm., and with soil and air temperatures, are given for each species. The influence of two methods of irrigation on transpiration rate is also shown. It is concluded that in the steppe zone transpiration is closely correlated with moisture in the top 2 m. of soil,  $\eta$  ranging from 0.67 to 0.77. Three ranges may be distinguished in the transpiration/s.m. curves: (1) When moisture is abundant, a reduction in s.m. is associated with increases in soil and air temperatures, and so also with increase of transpiration. (2) When s.m. is between 60-70 and 80-90% of the moisture equivalent a relatively small decrease of s.m. is accompanied by a sharp reduction in transpiration. This moisture range corresponds to the rupture of capillary water columns and sudden decrease of the mobility of soil water. (3) When s.m. is still lower, transpiration remains at a constant low level. The different species show some differences in the position of maximum transpiration on the curves and in the slope of the curves.

Transpiration of *Q. robur* and *F. pennsylvanica* is closely related to soil temperature, the optimum being 15-18° C. at a depth of 20 cm. Air temperatures > 28° appear to depress transpiration. For the upper soil horizons, the influence of moisture on transpiration is masked by that of soil temperature.

1350. HUBER, B. Bemühungen zur Senkung von Transpirations- und Atmungsverlusten in Waldbeständen. [Attempts to reduce transpiration and respiration losses in forest stands.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (81-90). 21 refs. [G.]

A general discussion of the relations of respiration, transpiration and dry-matter production, with special reference to the problem of combining water conservation with high forest productivity in areas with water shortage (e.g. the Ruhr). Selection of water-economical species and races, the effect of certain nutrients or trace elements on transpiration/assimilation ratios, and the adverse effects of SO<sub>2</sub> are touched upon [cf. *F.A.* 18 No. 2473].

1351. REES, A. R. **Photosynthesis.** *Rep. W. Afr. Inst. Oil Palm Res.* 1956/57, 1957 (113-4).

An apparatus has been designed for determining the rate of photosynthesis of Oil Palm leaves and leaflets. Two parallel air-streams are drawn through the two halves of the apparatus at equal flow rates. The CO<sub>2</sub> is absorbed from the air-streams by NaOH suspended in columns containing glass beads. After precipitating the carbonate with BaCl<sub>2</sub>, the residual NaOH is estimated by titration. The amount of CO<sub>2</sub> absorbed by the leaf in one system may therefore be calculated. Preliminary tests showed that complete absorption of CO<sub>2</sub> occurred at the flow rates employed, and that the errors of the method are small.

1352. TRANQUILLINI, W. Standortsklima, Wasserbilanz und CO<sub>2</sub>-Gaswechsel junger Zirben (*Pinus cembra* L.) an der alpinen Waldgrenze. [Microclimate, water balance and CO<sub>2</sub> exchange in

young *P. cembra* at the alpine forest limit.] *Planta* 49 (6), 1957 (612-61). Many refs. [G.g.] O.B.D.

In the winter of 1954-55 data were collected in the Ötztal immediately above the forest limit at alt. 2070 m., on climate, microclimate, needle temperature, insolation and ground temperature of, and gas exchange in, naturally regenerated *Pinus cembra* both above and to some extent beneath the snow. Early frosts in September can induce the onset of winter dormancy. At the end of October assimilation capacity is about half that in May at comparable light intensities; with severe November frosts assimilation is reduced to about  $\frac{1}{10}$  of its original level. Respiration also decreases. During short-term temperature rises, respiration increases more quickly than photosynthesis and, in sunshine, CO<sub>2</sub> may be given off. If it becomes cold enough for the ground to be frozen to root depth, the stomata also close, preventing any increased respiration, while photosynthesis is restricted to the utilization of CO<sub>2</sub> released by respiration within the needles. Outwardly no gas exchange takes place. As a result of repeated cold spells, branches remaining above the snow do not compensate for respiration; with intense cold, photosynthesis ceases completely; the balance, therefore, remains continually negative (slight emission of CO<sub>2</sub>), even when needle temperature rises temporarily above 0° C. Further heating activates respiration only, so that CO<sub>2</sub> emission increases. The reduction of photosynthetic processes is doubtless a result of the decomposition of chlorophyll in the needles, caused by the combined influence of cold and sunshine and possibly also by lack of moisture, and is signalized, particularly at high altitudes, by conspicuous yellowing of the needles. Only when temperatures rise consistently and the soil thaws (conditions favouring the re-opening of the stomata) is dormancy broken and photosynthesis accelerated. This process is quicker on the shade side of large crowns than with the yellowed needles on the sun side. Gas exchange in young trees remaining for 5 months under the snow could not be measured with any reliability. The following observations were, however, made: at ground level there was considerable lack of light; temperatures remained fairly constant between 0 and 10°; the ground remained frozen until the end of May, circumstances not favouring accumulation of plant material, but needles remained fresh and green and, far from showing a water deficit, seemed to have an increased water content. With the thaw, such trees immediately became active. In depressions and sheltered sites, where snow lies, the beginning of the vegetative period can be delayed until July, doubtless the reason for the general lack of trees on such sites.

1353. RUTTER, A. J. **Studies in the growth of young plants of *Pinus sylvestris* L. I. The annual cycle of assimilation and growth.** *Ann. Bot.* 21 (83), 1957 (399-426). 30 refs. O.R.E.

The annual cycle of growth in 2- to 5-year plants grown on different soils was studied, chiefly by determining weight changes through periodic samplings at monthly intervals. Measurements also included growth of basal diameter, leading



shoot, and needles. In the months following bud-break, there was generally no weight increase, despite rapid elongation of shoots and roots. During May and June, the main weight increases were in new shoots; later they were about equalled by those in stems and roots combined. Under favourable conditions, mean daily relative growth rates for May to September were between 1.0 and 0.4%, the lower rates relating to older plants. From October to March, slow weight increases occurred in needles, stems and roots. Net assimilation rates fell with increasing age. In the summer of the 5th year, the rate was 0.06 g. (oven-dry)/g. (oven-dry)/week or 0.10 g./100 sq. cm. leaf area/week. The apparent discrepancy between this rate, which is lower than any hitherto reported for plants growing under natural, unshaded conditions, and the dry-matter production of Scots Pine, which is very high [cf. *F.A.* 19 No. 2163] is thought to be explicable by the continuous assimilation.

1354. KOZŁOWSKI, T. T. Effect of continuous high light intensity on photosynthesis of forest tree seedlings. *For. Sci.* 3 (3), 1957 (220-4). 12 refs.

Apparent photosynthesis of 2-year-old *Pinus taeda* (a), *Quercus rubra* (b), and *Cornus florida* (c), measured hourly from 9 a.m. to 4 p.m. under 10,000 ft.-candles, decreased in (a) from 11 a.m. and in (b) and (c) from 10 a.m., the % reduction of (a), (b) and (c) at 4 p.m., being 11.4, 30.5 and 17.8 respectively; (b) and (c) resemble shade-adapted, and (a) light-adapted plants.

1355. BOLLARD, E. G. Translocation of organic nitrogen in the xylem. *Aust. J. biol. Sci.* 10 (3), 1957 (292-301). 16 refs. O.R.S.

Determinations have been made of the nitrogenous compounds present in xylem sap from a range of dicotyledons [including *Casuarina equisetifolia*, *Salix discolor*, *Juglans regia*, *Alnus glutinosa*, *Acer pseudoplatanus* and *Ulmus glabra*], monocotyledons and gymnosperms [*Ginkgo biloba*, *Taxus cuspidata*, *Podocarpus totara*, *Cephalotaxus drupacea* var. *pedunculata*, *Agathis australis*, *Pinus radiata*, *Sequoia gigantea*, *Chamaecyparis lawsoniana* and *Ephedra* sp.]. Nitrate N was present in sap from a few species in appreciable amounts, but in most was either absent or present as a trace only. All saps contained a range of amino-acids and amides. Glutamine and asparagine were quantitatively the most important compounds present in nearly all species. Some saps contained either citrulline or allantoic acid as a major constituent. *Author's summary.*

1356. GUITTON, Y. Sur le métabolisme azoté des gymnospermes. Présence de l'arginase dans les graines. [The N metabolism of gymnosperms: the presence of arginase in seeds.] *C.R. Acad. Sci., Paris* 245 (14), 1957 (1157-60). 4 refs. [F.f.] O.R.S.

Arginase was absent from *Pinus cembra*, *Taxodium distichum*, *Cephalotaxus fortunei* and *Taxus baccata*, and present in varying amounts in *Pinus nigra* var. *austriaca*, *P. sylvestris*, *P. pinaster*, *P. pinea*, *Abies alba*, *Cedrus atlantica*, *Picea abies* and *Pseudotsuga taxifolia*; *A. alba* contained the largest quantities, mainly in the endosperm. Urease was absent from

*Cephalotaxus fortunei* and *Taxus baccata* but present in all other species, the largest amounts being found in *Taxodium distichum*. Moisture absorption by the seeds increased the arginase but not the urease activity. Little difference in arginase or urease activity has so far been found between control seeds of *A. alba* and those submitted to prolonged cold.

1357. DAVID, R., et al. Sur le mécanisme de la formation de l'oléorésine dans les feuilles de pin maritime. [The mechanism of oleoresin formation in the needles of *Pinus pinaster*.] *C.R. Acad. Sci., Paris* 245 (6), 1957 (715-8). 1 ref. [F.f.] O.R.S.

Studies over several years on needles of *Pinus pinaster* have failed to confirm the interpretation of Bargues (1929). Although there are daily variations in the starch content of the needles, these do not occur in material, stained by Sudan III, found mainly in very large amounts in the outer cells of the chlorophyll-containing parenchyma. This material was identified with esters of fatty acids, not as neutral oleoresin. A close parallel was found between the annual variations of starch and of free resin acids (maximum April-May, minimum in winter).

1358. BERNARD-DAGAN, C. Variations saisonnières de la teneur en glucides des feuilles de pin maritime. [Seasonal variations in the carbohydrate content of *Pinus pinaster* needles.] *C.R. Soc. Biol., Paris* 151 (3), 1957 (566-8). 1 ref. [F.f.] O.R.S.

[Cf. *F.A.* 17 No. 125.] An inverse relationship was found between the content of soluble and insoluble carbohydrates throughout the year, the former reaching a maximum in winter and a minimum in summer and the latter a minimum in winter and a maximum in May.

1359. DAVID, R., and BERNARD-DAGAN, C. Influence du gemmage sur la teneur en glucides des feuilles du pin maritime. [The effect of tapping on the carbohydrate content of leaves of *Pinus pinaster*.] *C.R. Soc. Biol., Paris* 151 (3), 1957 (568-72). 2 refs. [F.f.] O.R.S.

A comparison of tapped trees and controls over 2 years showed that tapping caused no reduction in the carbohydrate content of the needles, but a slight increase in soluble sugars.

1360. MOLOTKOVSKIY, G. H., and IZMAJLOV, A. F. Soderzhanie hlorofilla, askorbinovoy kisloty i aktivnost' katalazy v list'yah nekotorykh plakuchih form drevessnyh rastenij v svyazi s javleniem poljarnosti. [Chlorophyll and ascorbic-acid content and catalase activity in leaves of some weeping forms of tree species in relation to polarity.] *Dokl. Akad. Nauk SSSR* 113 (5), 1957 (1165-7). 14 refs. [Russ.] A.P.B.

Chlorophyll and ascorbic-acid contents and catalase activity were determined in leaves taken from the base, middle, and apex of shoots of ordinary and weeping forms of *Fraxinus excelsior*, *Salix* spp., *Sophora japonica*, *Forsythia* spp. and *Caragana arborescens*. The highest chlorophyll and ascorbic-acid contents and the greatest catalase



activity were observed in leaves from the apex even in the weeping forms where the apex is directed downwards.

1361. GEROLA, F. M., and BARBESINO, M. Modificazioni dell' attività deidrogenasica dei tessuti cambio-liberiani dei rami in conseguenza di anellazioni. [Modifications in the dehydrogenase activity of the cambium and phloem of branches as a result of band-girdling.] *Nuovo G. bot. ital. (n.s.)* 63 (2/3), 1956 (186-93). 11 refs. [It.e.] A.P.B.

Branches of *Forsythia viridissima*, *Populus nigra* var. *italica*, and *Prunus avium*, and 3-year stool shoots of *Corylus avellana* were band-girdled to a width of 4-5 cm. in spring. This was found to modify the normal apex-base gradient of dehydrogenase activity, and resulted in the development of two gradients, with maxima immediately above and below the zone where the phloem had been interrupted.

1362. GEROLA, F. M., and BARBESINO, M. Ricerche sull'influenza della polarità e della neoformazione di apici meristematici sull'attività deidrogenasica dei tessuti cambio-liberiani in talee di pioppo (*Populus italica*). [The effect of polarity and of the formation of new meristematic apices on dehydrogenase activity in the cambium and phloem of Poplar (*P. nigra* var. *italica*) cuttings.] *Nuovo G. bot. ital. (n.s.)* 63 (2/3), 1956 (213-9). 13 refs. [It.e.] A.P.B.

Segments of branches were placed in sawdust, erect, horizontally, and upside down. Analysis of dehydrogenase activity revealed the presence of definite gradients which appeared to be related to the intrinsic polarity of the branches, the translocation of stimulating substances, and the appearance of meristematic apices. The stimulating action of shoot apices was much more intense than that of the root primordia.

1363. WILNER, J. Seasonal changes in electrical conductance of twigs of woody plants used in home orchards and windbreaks on the Canadian Prairies. *Abstr. in Agricultural Institute Review, Ottawa* 12 (3), 1957 (39). O.R.E.

Studies at the Forest Nursery Station, Indian Head, Sask., indicated that increased cellular activity of woody twigs was accompanied by greater electrical conductance, making it possible to distinguish between active and dormant states of some shelterbelt species. Electrical conductance of tissues appeared to be a persistent inherent trait. [Cf. *F.A.* 16 No. 4174.]

1364. NEWCOMER, E. H. The effect of high frequency sound waves upon the growth of Walnut trees. *Report, Northern Nut Growers Association, New Haven, Conn.* 1955, 1955 (47-8). E.M.B.

Ten young grafted *Juglans nigra*, in full green bud, had all lateral growth removed, and in 6 of them the apical buds were treated with water-borne ultrasonic waves at a frequency of 400,000/sec. and an intensity of 20 watts/sq. cm. for 60 sec. each. All 10 were planted out in the field, average height being 2 ft. After 7 years, the controls were ca. 18 ft. high; of the treated trees 2 had died, 2 had grown ca. 2 ft., and 2

had grown < 1 ft. Growth rate, was, however, increasing, and may in time become normal. Contortion and curling of leaves ceased after one year, and crowns, though small, were normal.

## 162. Pathology. Teratology

See also Nos. 1389, 1955, 1965.

1365. CAPELLI, M. Produzione di pine anomale in *Pinus pinea* L. [Production of anomalous cones on *P. pinea*.] *Ital. for. mont.* 12 (4), 1957 (192-3). [It.]

Describes a tree that bore normal cones on the side facing the sea, and smaller, cylindrical ones on the other side.

1366. SPÎRCEZ, Z. Semnalări de anomalii la scumpie, duglas, vișin turcesc și stejar. [Some anomalous features of *Rhus cotinus*, *Pseudotsuga taxifolia*, *Prunus mahaleb* and *Quercus robur*.] *Rev. Pădurilor* 1957 (9), (584-8). 5 refs. [Rum.]

1367. NEMKY, E. Néhány teratológias és rendes jelenség fás növényeken. [Some teratological and normal phenomena in woody plants.] *Erdömérn. Föisk. Közl.* 1956 (2), (3-19). 24 refs. [Hu.hu.russ.g.]

Describes, with 28 illustrations, aberrant forms in the leaves of Hornbeam, Oak, Beech and Walnut, in the cotyledons and germination of Oak, in the phyllotaxis of Ash; also proliferation in Larch cones; a monoecious shoot of *Salix caprea*, and Horse Chestnut with adventitious roots growing into its own rotted heartwood.

## 163. Embryology

1368. BARTELS, H. Kultur isolierter Koniferembryonen I, II. [Cultures of isolated conifer embryos, I, II.] *Naturwissenschaften* 44 (9; 22) 1957 (290-1; 595-6). 3 refs. [G.] O.R.S.

Describes: (I) a method successfully used to grow the embryos of *Pinus ponderosa*, *P. nigra*, *P. strobus*, *P. sylvestris* and *Pseudotsuga taxifolia* on a nutrient medium; (II) results of experiments to find an optimum medium for growing embryos of *P. nigra*.

1369. NARAYANA, L. L. Study of the gametophytes in *Garuga pinnata* Roxb. *Sci. & Cult.* 23 (5), 1957 (248-9). 2 refs. E.M.B.

High-magnification drawings of the cross-section of a half anther showing primary archesporium, and longitudinal sections of the developing ovule, with descriptive notes.

1370. GHOSH, S. S., and SHAHI, R. A case of polyembryony in *Shorea robusta* Gaertn. *Sci. & Cult.* 23 (5), 1957 (254-6). 5 refs. E.M.B.

Stated to be the first report of this condition in Dipterocarpaceae. Two forms, conjoint and unattached, are illustrated and described. In 2000 fruits, 2 of the former and 8 of the latter occurred.

1371. DNYANSAGAR, V. R. Embryological studies in the Leguminosae. V. *Prosopis spicigera* and *Desmanthus virgatus*. *Bot. Gaz.* 118 (3), 1957 (180-6). 23 refs. O.B.D.

1372. GARUDAMMA, G. K. Studies in the Meliaceae. II. Gametogenesis in *Melia azadirachta* Linn. *J. Indian bot. Soc.* 36 (2), 1957 (227-31). 4 refs. O.B.D.



1373. NARAYANA, L. L. *Embryology of two Simaroubaceae*. *Curr. Sci.* 26 (10), 1957 (323-4). 3 refs. A.P.B.

*Balanites roxburghii* and *Ailanthus excelsa*.

#### 164. Morphology

See also Nos. 1409-10, 1415, 1418, 1664, 1896.

1374. WHITE, D. J. B. *Anisophylly of lateral shoots*. *Ann. Bot.* 21 (82) 1957 (247-55) 11 refs. O.R.E.

An examination of the leaves of *Acer pseudo-platanus*, distinguishing between primary, irreversible, and secondary, reversible anisophylly.

1375. TALBERT, C. M., and HOLCH, A. E. *A study of the lobing of sun and shade leaves*. *Ecology* 38 (4), 1957 (655-8). 6 refs.

In a study of 10 herb, 10 shrub, and 17 tree species, it was found that the perimeters of 57% of shade leaves (a) were larger than those of sun leaves (b); 98.8% of (b) were more deeply lobed than (a); a majority of (b) were darker and more hairy than (a); petioles of (a) were 65.9% longer than in (b); (b) were 100% thicker than (a); 75% of (a) were larger than (b). *From authors' summary*.

1376. CHANG, K. T., and WANG, F. H. [Morphology of pollen grains of Meliaceae.] *Acta Botanica Sinica* 5 (2), 1956 (253-65 + 4 plates). 4 refs. [Chin.e.] L.S.

Describes and illustrates the main characters of the pollen grains of 22 species, with a key to genera based on pollen characteristics.

1377. DĄBROWSKI, M. J. Zmienność wielkości ziarn pyłkow leszczyny (*Corylus avellana* L.) na tle zespołów leśnych Białowieckiego Parku Narodowego. [Variation in pollen grains of Hazel, and their connexion with forest associations in the Białowieża National Park.] *Acta Soc. Bot. Polon.* 26 (2), 1957 (299-307). 17 refs. [Pol.pol.e.] O.B.D.

Catkins were collected from 190 specimens in 5 different forest associations, and the distribution of pollen grain size was investigated. Statistical analysis of the results of this preliminary study indicates that a relationship exists between pollen grain size and type of association. *From author's summary*.

1378. LAZĂRESCU, C., and PIRĂU, V. Variabilitatea caracterelor ghindei la cer. [Variation in size and shape of *Quercus cerris* acorns.] *Rev. Pădurilor* 1957 (10), (636-7). [Rum.russ.g.f.e.]

#### 165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 1411, 1413, 1416-7, 1467, 1508, 1616 et seq., 1629-33, 1763, 1769, 1771, 1964, 1973, 2329.

1379. Tagung für Forstpflanzenzüchtung vom 27. bis 28. Juni 1956 in Wächtersbach (Hessen). [Forest tree breeding conference, 27-28 June 1956, in Wächtersbach (Hessen).] *Silvae Genet.* 6 (5), 1957 (157-62). [G.]

The following papers were among those presented:—Analyses of the progeny of selfing as a

means of verifying characters to be combined by crossing within the genus *Alnus* (H.-H. Heitmüller): presents, as part of investigations to find the genetically determined characteristics of Alder, some preliminary results of crosses between *Alnus incana* and *A. glutinosa* and of selfing of those species. Races of Oak and Beech (J. Krah-Urban). Notes on Larch breeding based on some results of the Büdinger Larch hybridization experiments (W. Langner). Production of forest tree seed in seed orchards (R. Schmitt). Individual crosses with Poplars of section *Leuce* (F. W. Seitz).

1380. Autorreferate von den Vorträgen der 5. Tagung der Arbeitsgemeinschaft für Forstgenetik und Forstpflanzenzüchtung in Berlin. [Reports of papers given at the fifth session of the Working Party for Forest Genetics and Tree Breeding in Berlin.] *Silvae Genet.* 6 (5), 1957 (150-6). [G.]

Includes papers on: Cytological observations on a 7-year-old C<sub>o</sub> Larch (Z. M. Illies): notes on aneuploidy observed in a mixoploid colchicine-treated tree. Self-fertility in *Picea omorika* (W. Langner): fertility in *P. omorika* was found to be higher after selfing than after crossing, and the high degree of uniformity in this species is explained on this basis. Some results in breeding for blister-rust resistance (H. Meyer). Variations in frost resistance in Douglas Fir seedlings (W. Neugebauer): in trials of 4 German and 4 American provenances, 2 of the American provenances proved markedly frost-resistant; the possibility is discussed of the existence of coastal Douglas Fir provenances suitable for German conditions. Reciprocal grafts with early- and late-flushing strains (T. Schmucker): several years' observations on such reciprocal grafts in Spruce and Beech showed that both scion and rootstock retained their original flushing characteristics. Breeding frost-resistant Douglas Fir (H. Schönbach). Observations on the progeny of a Pine with cone disease (O. Schröck) [see F.A. 19 No. 1389]. Grey Poplar crosses (F. W. Seitz): four progenies from crosses, using the same ♀ parent and 4 different ♂ parents, all within the section *Leuce*, showed variations in height growth but (in contrast with progeny from open-pollinated parents) a marked uniformity in growth habit. Regression coefficients of seed weight and seedling height in Spruce (K. Stern): studies of a Schleswig-Holstein and an Erzgebirge provenance revealed a wide genetic variation in the former.

1381. WRIGHT, J. W. *Studies to improve shade trees*. *Amer. Nurseryman* 106 (9), 1957 (56-7, 60-3).

An account of recent tree-breeding studies in the U.S.A., including work on hybrids of *Pinus*, *Platanus*, *Aesculus*, *Acer* and *Ilex* spp., seed sources of Oak and Pine, and experiments in breeding disease-resistant Elms.

1382. HALEY, C. *The present status of tree breeding work in Queensland*. Queensland Forestry Department. 1957. pp. 23. 6 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)



1383. BARBER, J. C., and STEWART, D. M. **Vacuum storage of pollen proves feasible.** *Minn. For. Note No. 62*, 1957. pp. 2. 8 refs.

At the end of one year, germination of pollen of Jack Pine, White Spruce and Norway Spruce, stored in a vacuum, did not differ significantly from that stored in air in a refrigerator.

1384. GATHY, P. À propos de l'hybride naturel *Abies concolor* (Gord.)  $\times$  *Abies grandis* Link. [**The natural hybrid *A. concolor*  $\times$  *A. grandis*.**] *Silvae Genet.* 6 (6), 1957 (186–90). 8 refs. [F.f.g.e.]

A heterogeneous progeny of an *Abies concolor* in Belgium was differentiated into 3 types, *concolor*, *grandis* and a hybrid. An anatomical examination of the needles confirmed the hybrid character of part of the progeny. In this connexion *A. lowiana* was examined and was found to have characters intermediate between the above-mentioned species. The author concludes that *A. concolor*, *A. lowiana* and *A. grandis* can be considered as pure species, but that their evolution is a function of their geographical distribution and ecological circumstances. The origin of the 3 species is not very distant in time, and a close relationship still exists between them. A diagram is given showing the supposed evolution of these species. [Cf. *F.A.* 17 No. 3646.] *From author's summary.*

1385. RUBNER, K. Der Aufbau der Fichtenkrone in den höheren Gebirgslagen. [**The structure of Spruce crowns at the higher altitudes.**] *Holz-Zbl.* 83 (120), 1957 (1460–2). 7 refs. [G.]

An illustrated description of crown forms of trees believed to be natives of the Bavarian Alps and various parts of the Central German mountain regions, chiefly the 'comb', the 'brush' and the 'plate' types, their resistance to, and modification by, frost, snow, ice and wind. The authors advocate using the survivors of local populations as seed sources, and extending the use of the 'plate' type to the highest altitudes in the Alps, as it has shown itself particularly hardy against wind, snow and ice. [Cf. *F.A.* 3 p. 290; 13 No. 3616.]

1386. KIELLANDER, C. L. En beaktansvärd granproveniens. [**A noteworthy Spruce provenance.**] *Svenska Skogsvärd. Tidskr.* 54 (3), 1956 (275–89). 16 refs. [Sw.sw.] Also in *Årsberätt. Fören. Växtförädl. Skogsträd, Stockh.* 1956 (37–51).

A rather fuller account of the Boserup Spruce [see *F.A.* 18 No. 1310].

1387. EHRENBORG, C., and GUSTAFSSON, Å. Plus- och minusträd: urval och avkommeprövning. [**Plus and minus [Pine] trees: selection and progeny trials.**] *Skogen* 44 (22), 1957 (722, 724, 727–8). [Sw.e.]

Discusses the results from crosses made at Boxholm, in a programme of research on progeny, obtained by free and controlled pollination, of plus and minus trees from a series of Pine stands throughout Sweden. Progeny of VIII 46, one of the minus trees represented, showed a high % of forking, abnormal bud formation and proleptic shoots. Progeny of both the minus trees had long, thick, acute-angled branches. Progeny of the two plus

trees were more vigorous as well as of better form than those of the minus trees. When the plus trees were crossed with VIII 46, the progeny showed more forking and prolepsis than in crosses between the plus trees, suggesting that these characters are dominant or semi-dominant.

1388. RUDEN, T. Arvelige dvergformer av furu (*Pinus silvestris* L.) fra Skjåk, Gudbrandsdal. [**Hereditary dwarf forms of Scots Pine at Skjåk, Gudbrandsdal.**] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (413–43). 34 refs. [Nor.nor.e.]

[Cf. *F.A.* 19 No. 109.] In provenance trials laid out in 1940, seed from Skjåk showed a high mortality and a high % of misshapen trees. A visit to the forest confirmed that the majority of trees were misshapen, showing a great variety of forms (illustrated); a few individual trees had straight stems and slender branches. At higher altitudes, above the more densely populated area, Pine forests were normal, with trees of good quality. Possible causes suggested for the misshapen forms are the unusually dry climate and some form of selection (e.g. by grazing sheep and goats, and use of inner bark of young straight Pines to mix with flour in bread-making) exercised during the 1000 years of human settlement.

1389. SCHRÖCK, O. Beobachtungen an der Nachkommenschaft einer Zapfensuchtkiefer. [**Observations on the progeny of a Pine with 'cone disease'.**] *Silvae Genet.* 6 (6), 1957 (169–78). 6 refs. [G.g.e.f.]

Describes the morphology of a 19-year-old Pine with 'cone disease' (abnormally high cone production), the quality of the seed, and the progeny after open pollination. The progeny showed great variations in vigour, growth habit, increment, foliage, form and size of cones, fertility and germination of the seeds. Abnormalities also occurred in the progeny, e.g. abnormally high cone production, early sexual maturity, formation of double leaders and of adventitious shoots, and forking of the lateral branches. The observations seem to show that abnormally high cone production may be genetically determined. The accumulation of defective mutants in the progeny is explained by the self-fertility of the parent tree. *From author's summary.*

1390. **Longleaf Pine hybrids.** *Res. Rep. Fla. Sch. For.* No. 4, 1957 (25–6).

Comparison of natural and artificial hybrids of *Pinus palustris*  $\times$  *P. elliotii* var. *elliotii* with South Florida Slash Pine (*P. elliotii* var. *densa*) leads to the conclusion that the latter may have originated through introgressive hybridization between Slash and Longleaf Pines.

1391. ZOBEL, B. J., and RHODES, R. R. **Specific gravity indices for use in breeding Loblolly Pine.** *For. Sci.* 3 (3), 1957 (281–5). 3 refs.

Highly significant correlations were found between sp. gr. of the bole and branch sections of 11-year-old trees [cf. *F.A.* 18 No. 903], and this relationship makes possible assessment of progeny tests at an early age, by using branch sections that do not destroy the seedlings. This was tested on 4-year-old, open-pollinated progeny from two parent trees,



(a) of high and (b) of low sp. gr. The progeny of (a) had significantly higher sp. gr. than that of (b), both as measured by branch sections and by bole measurements. Similar results were obtained from progeny of 3 supposedly selfed parents of different sp. gr. No correlation could be found between the sp. gr. of the branches of 4-year-old grafts and the sp. gr. of the tree from which the grafts had been obtained. These results suggest an hereditary basis for wood density as expressed by sp. gr. *From authors' summary.*

1392. FIELDING, J. M. **The breeding of Monterey Pine [*Pinus radiata*] in the Australian Capital Territory.** Forestry and Timber Bureau, Canberra. 1957. pp. 19. 16 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Subjects touched on include selection, establishment of seed plantations, vegetative propagation, hybridization, and polyploidy.

1393. ORR-EWING, A. L. **A cytological study of the effects of self-pollination on *Pseudotsuga menziesii* (Mirb.) Franco.** *Silvae Genet.* 6 (6), 1957 (179-85). 20 refs. [E.e.g.f.]

The study sought to determine whether or not a self-incompatibility system is responsible for the low yields of viable seed reported after selfing in this species. Controlled self- and cross-pollinations were made on 8 trees in 3 separate localities. Cone samples were removed from each tree at regular intervals and the ovules embedded for later sectioning. The remaining cones from the 8 trees were collected at maturity and the results of germination tests on the seed showed that the effects of self-pollination varied greatly from tree to tree. A detailed cytological study was made of the ovules of two of the trees on which the effects of self-pollination had been the most drastic. It was found that neither pollen germination nor its subsequent development were in any way inhibited after self-pollination and that syngamy and proembryo formation proceeded normally. The embryos, however, almost all collapsed at an early stage of development, apparently from some failure in the vital relationship between young embryos and their surrounding gametophytes. It is concluded that the embryo collapse is an inbreeding effect caused by the increased homozygosity of recessive deleterious genes. This explanation could account for the variable effects of self-pollination on different trees, as the number of such genes would not be constant. *From author's summary.*

1394. ORR-EWING, A. L. **Possible occurrence of viable unfertilized seeds in Douglas Fir.** *For. Sci.* 3 (3), 1957 (243-8). 13 refs.

The surviving seedlings from a few seeds derived from the parthenocarpic cones of one tree, showed little variation in height or form. Two embryos were later found in similar cones of two other trees. All seedlings and embryos were found to be diploid. There was no conclusive cytological evidence of the origin in agamospermy, but the possibility of pollination was remote.

1395. KRÜSSMANN, G. ***Alnus elliptica* 'Itolanda'.** *Deutsche Baumschule, Aachen* 8 (7), 1956 (224, 226). [G.] E.M.B.

Describes and illustrates an Alder hybrid (*A. cordata* × *A. glutinosa*) bred by Doorenbos, which is stated to be fast-growing and of good form. Grown since 1946, this hybrid has not yet been marketed.

1396. HARDIN, J. W. **Studies in the Hippocastanaceae, IV. Hybridization in *Aesculus*.** *Rhodora* 59 (704), 1957 (185-203). 22 refs. O.B.D.

A review of present knowledge with an analysis of introgression based on random samples from over 30 populations throughout the range of section *Pavia*.

1397. PRYOR, L. D. **The inheritance of some characters in *Eucalyptus*.** *Proc. Linn. Soc. N.S.W.* 82 (1), 1957 (147-55). 11 refs. D.S.I.R.

The nature of the inheritance of some characters has been examined by studying open-pollinated progeny from naturally occurring hybrids and from a few synthesized  $F_1$  hybrids. Juvenile leaf-, bud- and fruit-shape in hybrids are found to be intermediate between the parents, as also juvenile leaf anatomical features and some mature leaf features. There is evidence of independent assortment and recombination in several characters. Lignotubers are an inherited characteristic capable of a degree of recombination. Vigour of growth in  $F_1$  hybrids in the series studied is, for most combinations, inferior to that of the parents, but improves the more closely the parents are related in the systematic sense, culminating in probable positive heterosis between closely related species. Very irregular rate of growth in different individuals is a feature of hybrid progenies as compared with progeny of pure species. *From author's summary.*

1398. KOPECKY, F. **Néhány adat az akác nemesítéséhez. [Contributions to the breeding of Locust tree (*Robinia* sp.).]** *Erdész. Kutatás., Budapest* 1957 (1/2), (19-29). 16 refs. [Hu.hu.russ. e.g.]

Scions from branches of mature trees, grafted on young seedlings, show very vigorous growth. Flower and leaf buds are indistinguishable by size; as the former are found near the apices of the branchlets, from which the scions are taken, most of the stocks grafted with scions from old trees flower in the year of grafting. Pollen and stigma mature simultaneously with the expansion of the standard. There is no protandry in *Robinia*. Greatest germinative energy in the pollen of *R. pseudoacacia* and *R. pyramidalis* occurs in 50% sucrose solution drop-cultures. Bagged flowers were not self-fertilized, in spite of being shaken by the wind; insects (especially bees) are necessary for pollination. [Cf. *F.A.* 15 No. 2289.]

1399. SCHÖNBACH, H. **Die bisherigen Ergebnisse der Züchtungsarbeiten mit verschiedenen Pappelarten der Sektion *Leuce*. [Breeding trials with Poplars of the Section *Leuce*. Results to date.]** *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (Beitr. Pappelforsch. No. 2), 1957 (149-78). 22 refs. [G.g.]

A brief review of the literature, and a preliminary



report on the results of inter- and intraspecific crosses of German, E. European and Scandinavian provenances of *P. tremula*, *P. alba*, and *P. canescens*, carried out in Europe since 1950. The work was seriously hampered by losses caused by *Fusicladium radiosum*. Site differences affected height growth and branching habits at an early stage.

1400. LITTLE, E. L., JR., BRINKMAN, K. A., and McCOMB, A. L. **Two natural Iowa hybrid Poplars.** *For. Sci.* 3 (3), 1957 (253-62). 16 refs.

Gives descriptions in English of the Shimak (♀) and Sherill (♂) clones of *Populus alba* × *P. grandidentata* (Iowa hybrid Poplar) and tabulates a comparison of characters of the parent clones. Each clone covers 2 or more acres [map references identical with those of *F.A.* 16 No. 125]. The Sherill Poplar has a wavy figure.

1401. HÅKANSSON, A. **Chromosome number and meiosis in *Salix* (*grandifolia* × *gracilistyla*) × *S. (silesiaca* × *aegyptiaca*).** *Hereditas, Lund* 42 (3/4), 1956 (519-20). [E.] O.R.S.

#### 168. Histology

See also Nos. 1664, 1896, 1965, 2242 *et seq.*

1402. PELET, F., and HILDEBRANDT, A. C. **Growth *in vitro* at various temperatures and acidities of tissues isolated from galls and normal stems of Elm, grape, Poplar and Willow.** *Abstr. in Phytopathology* 47 (9), 1957 (531).

Optima for growth on two synthetic media with growth-promoting supplements are given from tests covering the temperature range from 16° C. by 4° to 36° and the acidity range from pH 3.5 to 8 at 26° C.

1403. MAÁ CZ, G. J. **Über die Blattepidermis von *Ginkgo biloba* L. [The leaf epidermis of *G. biloba*.]** *Acta biol., Budapest* 7 (4), 1957 (403-10). 5 refs. [G.g.russ.e.] O.R.S.

The upper and lower epidermis of the leaf were compared in the course of microscopic examinations. On the upper epidermis and along the edge of the leaf-blade of the hypostomatic leaf, rudimentary traces of stomata were found; also along the latter, well developed but small stomata could be detected. The development of the change from the amphistomatic leaf of [the fossil] *G. adiantoides* to the hypostomatic leaf of *G. biloba* is sketched. *From author's summary.*

#### 17. Systematic Botany

##### 172.3. Schizophyta (Bacteria and Blue-green Algae)

See Nos. 1921, 1958-9.

##### 172.8. Eumycetes (True Fungi)

See also Nos. 1922 *et seq.*, 2435 *et seq.*

1404. BARNETT, H. L. ***Hypoxylon punctulatum* and its conidial stage on dead Oak trees and in culture.** *Mycologia* 49 (4), 1957 (588-95). 4 refs. P.R.

*Basidiobotrys*, isolated frequently from Oak-wilt trees in W. Virginia, is shown to be the conidial stage of *Hypoxylon punctulatum*. The ascospores and conidia germinate poorly on agar.

1405. ELLIS, M. B. **Some species of *Teratosperma*.** *Mycol. Pap. Commonw. mycol. Inst.* No. 69, 1957. pp. 7. 5 refs.

Describes *T. singulare* (on leaves of *Ulmus parvifolia*), *T. pulchrum* (on bark of dead *Carpinus americana*), *T. cornigerum* (on bark of dead *Carpinus* sp.), and *T. anacardii* (on foliicolous lichens on several W. African tree species).

##### 174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 1782-3, 2229, 2242, 2247.

1406. KASAPLIGIL, B. **Plants of Jordan with notes on their ecology and economic uses.** Forestry Department, Amman. 1956. pp. 130 + [5] + map. [E.arab.] (Expanded Technical Assistance Program, FAO.) Limited distribution.

Includes native and some exotic trees.

1407. KEAY, R. W. J. **Names of Nigerian trees—some recent corrections.** *Inform. Bull. Dep. For. Res. Nigeria* No. 42, 1957. pp. 13. 1 ref.

Includes the following generic names (old names bracketed): *Nesogordonia* (*Cistanthera*); *Maytenus* (*Gymnosporia*); *Diospyros* (*Maba*); *Anthonotha* and *Gilbertiodendron* (*Macrolobium*); *Mammea* (*Ochrocarpus* in part); *Dacryodes* (*Pachylobus*); *Blighia* (*Phalodiscus*); *Piptadeniastrium*, *Entada* and *Newtonia* (*Piptadenia*); *Oxystigma* (*Pterygopodium*); *Aidia*, *Rothmannia*, *Euclinia* and *Massularia* (*Randia*); and *Nauclea* (*Sarcocephalus*).

1408. MIRANDA, F. **El género *Mortoniendron* y otros árboles notables de la selvas del sur de México. [The genus *Mortoniendron* and other noteworthy trees of the S. Mexican forests.]** *An. Inst. Biol. Univ. Méx.* 27 (2), 1956 (321-36). [Span.] C.G.B.

Includes a description of two new species of *Mortoniendron* (*M. palaciosii*, and *M. ruizii*) and a first report for Mexico of the presence of *Orthion* (*O. malpighiifolius* and *O. subsessile*).

##### 174.2/.7. Gymnosperms

See also Nos. 1384, 1390, 2248-50, 2257.

1409. HIDA, M. **[The comparative study of Taxodiaceae from the standpoint of the development of the cone scale.]** *Bot. Mag., Tokyo* 70 (824), 1957 (44-51). 7 refs. [Jap.jap.e.e.] I.M.I.

This study includes *Sciadopitys*, *Cunninghamia*, *Taiwania*, *Athrotaxis*, *Cryptomeria*, *Taxodium*, *Glyptostrobus*, *Sequoia*, *Sequoiadendron*, and *Metasequoia*. Cone-scale development is similar in the last 3 species, an affinity of *Metasequoia* further confirming that found for its form of tracheids. The last 5 genera form a wider group separated by the numbers of protoxylem bundles in their roots.

1410. HEJNOWICZ, Z. **Rozwojowe badania nad wierzchołkami pędu *Chamaecyparis pisifera* i interpretacja formy *squarrosa*. [Ontogenetic study of shoot apices in *C. pisifera* and an interpretation of f. *squarrosa*.]** *Acta Soc. Bot. Polon.* 26 (2), 1957 (413-66 + 6 plates). 70 refs. [Pol.pol.e.] O.B.D.

The investigations do not support the theory held



hitherto that *f. squarrosa* is a juvenile form, but suggest rather that it is a primitive form. *From author's summary.*

1411. Sección de botánica forestal y fitogeografía. [Section for forest botany and plant geography.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (13-24 + 6 plates). [Span.]

A report is presented on the work of the Institute in the study of races and varieties of Pine in Spain.

1412. WU, C.-L. [The taxonomic revision and phytogeographical study of Chinese Pines.] *Acta Phytotaxonomica Sinica* 5 (3), 1956 (131-63 + 20 drawings, 2 maps). 8 refs. [Chin.e.]

Eleven species and 7 varieties are discussed [with drawings of cone scales and seeds], with brief recommendations on choice of species for various localities. Several species are regarded as synonymous and others are reduced to varieties. A study of the distribution of species of the subgenera *Haploxylon* and *Diploxylon* suggests that the latter are more drought-resistant and better suited to poor sites, and that the former, except *P. bungeana*, need moister, more fertile soils. *From author's summary.*

1413. CRITCHFIELD, W. B. Geographic variation in *Pinus contorta*. *Publ. Maria Moors Cabot Found.* No. 3, 1957. pp. 118. 129 refs.

The data from analysis of several quantitative characters (particularly cone dimensions, orientation, maturity etc.) lead the author to distinguish several regional forms meriting recognition as subspecies: (1) coastal region *Pinus contorta* subsp. *contorta*, (2) Mendocino white plains subsp. *bolanderi*, (3) Rocky Mountains subsp. *latifolia*, and (4) Sierra Nevada subsp. *murrayana*.

### 176.1. Dicotyledons

See also Nos. 1376, 1395-7, 1400, 2251-5.

1414. COOPER, R. E. The Sycamore tree: the *Deurshuil* or Remembrance Tree. *Scot. For.* 11 (4), 1957 (169-76).

Speculations on the history of its introduction to Britain, legends connected with it, uses etc.

1415. CUNNINGHAM, F. E. A seed key for five Northeastern Birches. *J. For.* 55 (11), 1957 (844-5). *Betula lutea*, *B. lenta*, *B. nigra*, *B. papyrifera*, *B. populifolia*.

1416. MIŠIĆ, V. Principi i metode u istraživanju sistematike bukve u Jugoslaviji. [Principles and methods in research on Beech systematics in Yugoslavia.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 6 (1), 1955. pp. 14. 10 refs. [Serb.e.]

Research was carried out in 1952 on the ecology and systematics of Beech in different parts of Yugoslavia. It is concluded that only one species of Beech is found in Yugoslavia, this species having several ecotypes corresponding to variations in site factors.

1417. MIŠIĆ, V. Ancestralne pojave na listu Balkanske bukve (*Fagus moesiaca* Czecz.) u Jugoslaviji. [Ancestral features in leaves of *F. moesiaca* in Yugoslavia.] *Repr. from Arhiv Bioloških Nauka,*

*Srpsko Biološko Društvo, Beograd* 7 (1/2), 1955 (115-20 + 2 photos). 8 refs. [Serb.e.]

Leaves from *F. moesiaca* growing in Slovenia, Macedonia and W. and S.W. Serbia were found to have morphological characters common to fossil forms of Beech. The morphological development of Beech leaves is briefly discussed.

1418. MIŠIĆ, V. Individualni polimorfizam lista Balkanske bukve u okviru lednog drveta. [Polymorphism in leaves of the same tree for *Fagus moesiaca*.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 6 (4), 1956. pp. 25. 17 refs. [Serb.e.]

From each of 3 Beech trees on Mt. Avala, near Belgrade, 100 leaves taken from different parts of the crown were examined. The morphological differences observed are discussed. The author concludes that the differences are primarily the result of adaptation to different intensities of direct and indirect insolation and are not correlated with distance from the bole or the root system.

1419. MARTINEZ, M. Los encinos de México. VII. [The Oaks of Mexico. VII.] *An. Inst. Biol. Univ. Méx.* 27 (2), 1956 (373-95). [Span.] C.G.B. [Cf. *F.A.* 18 No. 3742.]

1420. JOACHIM, H. F. Eindrücke über den Stand des Pappelbaues und der Pappelforschung in der Bundesrepublik Deutschland. [Poplar growing and Poplar research in the German Federal Republic.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (48-58). 146 refs. [G.]

A review with a bibliography of the chief publications of the last 10 years, classified by main subjects. [Cf. *F.A.* 19 No. 1768.]

1421. FRIES, R. E. New species of Annonaceae from the Upper Amazon Basin. *Ark. Bot.* 3 (6), 1957 (599-606 + 5 plates). [E.] O.B.D.

The following new tree species are described: *Duguetia oblanceolata*, *Guatteria cylindrocarpa*, *G. denudata*, *G. latipetala*, *Rollinia amazonica*, *Tetrameranthus macrocarpus*, *Xylopia gigantophylla*, and *X. multiflora*.

1422. KOSTERMANS, A. J. G. H. Le genre *Ocotea* Aubl. (Lauraceae) au Madagascar. [The genus *Ocotea* in Madagascar.] *Commun. For. Res. Inst., Bogor* No. 60, 1957. pp. 44. [F.e.]

Describes 32 species found on the island, including the new species *O. alveolata*, *O. auriculiformis*, *O. capuronii*, *O. caudatifolia*, *O. corethroides*, *O. cryptocaryoides*, *O. discoidea*, *O. domatifera*, *O. elliptica*, *O. eriothyrsa*, *O. involuta*, *O. macrorrhiza*, *O. pedunculata*, *O. perforata*, *O. sessiliflora* and *O. similis*.

1423. GARDNER, C. A. The Manna Wattle (*Acacia microbotrya* Benth.) *Bull. Dep. Agric. W. Aust.* No. 2443, 1957. pp. 4.

Notes on distribution, and a description.

1424. BARBOSA, L. A. GRANDVAUX, and TORRE, A. R. Uma nova espécie de *Pterocarpus* (Leguminosae). Claves e enumeração das espécies moçambicanas. [A new species of *Pterocarpus*



[*P. brenanii*] (Leguminosae). Keys to and descriptions of the species of Mozambique.] *Garcia de Orta, Lisboa* 5 (1), 1957 (121-7). [Port.]

1425. DUCKE, A. O gênero *Strychnos* no Brasil. [The genus *Strychnos* in Brazil.] *Bol. téc. Inst. agron. Norte* No. 30, 1955. pp. 64 + 1 set of drawings. 26 refs. [Port.e.f.]

Of the known American species, 54 have been recorded in Brazil, the largest number being found in the Amazonian Hylaea. Present knowledge of *Strychnos* in Brazil is reviewed, with notes on the 54 known species. A summary of characteristics of the fruit is also included.

1426. BASCOPÉ, F., BERNARDI, A. L., and LAMPRECHT, H. Descripciones de árboles forestales No. 1. *Swietenia macrophylla* King. [Descriptions of forest trees No. 1. *S. macrophylla*.] Instituto Forestal Latino Americano de Investigación y Capacitación, Mérida. 1957. pp. 18 + 2 plates, 2 tpls. 26 refs. [Span.]

A summary of available information on taxonomy, morphology, silviculture, and the characteristics and uses of the wood.

1427. BASCOPÉ, F., et al. Descripciones de árboles forestales No. 2. El género *Cedrela* en América. [Descriptions of forest trees No. 2. The genus *Cedrela* in America.] Instituto Forestal Latino Americano de Investigación y Capacitación, Mérida. 1957. pp. 25 + 6 plates. 37 refs. [Span.]

Taxonomy of the genus, descriptions of the Venezuelan species, silviculture of *C. mexicana* and the characteristics and uses of the wood of *Cedrela* spp.

1428. KAUSEL, E. Beitrag zur Systematik der Myrtaceen. II. [Taxonomy of the Myrtaceae. II.] *Ark. Bot.* 3 (6), 1957 (607-11). 4 refs. [G.] O.B.D.

A new genus *Acmenosperma* is erected to cover *Eugenia claviflora*, also a new subfamily, *Acmenosideae*, based on embryo structure, to include *Acmena*, *Piliocalyx* and *Acmenosperma* [cf. *F.A.* 18 No. 1350].

1429. HINGORANI, G. R. Review of name changes in some Burmese species of *Eugenia*. *Indian For.* 83 (12), 1957 (713-7). 15 refs.

1430. ROYEN, P. VAN. Revision of the Sapotaceae of the Malaysian area in a wider sense. IIa. Additional notes on *Burckella* Pierre. Va. Additional notes on *Manilkara* Adanson. *Blumea* 8 (2), 1957 (201-6). Many refs. O.R.S.

[Cf. *F.A.* 14 No. 3126; 16 No. 177.] (IIa) Gives more details from new material of *B. macropoda* var. *macropoda*, *B. erythrophylla*, *B. polymera* and *B. hillii*; (Va) *M. napali* sp. nov.

1431. ROYEN, P. VAN. Revision of the Sapotaceae of the Malaysian area in a wider sense. VI. *Xantolis* Rafinesque. *Blumea* 8 (2), 1957 (207-34). Many refs. [E.] O.R.S.

Gives a key to and describes the following species: *X. shweliensis*, *X. boniana* and 3 varieties, *X. hookeri*, *X. stenosepala*, *X. racemosa*, *X. baranense*, *X. siamensis*, *X. parvifolia*, *X. maritima*, *X. burmanica* and 2 varieties, *X. tomentosa*, *X. cambodiana* and 2

varieties, *X. assamica* and *X. embeliifolia*. All except *X. tomentosa* are new combinations.

1432. ROYEN, P. VAN. Revision of the Sapotaceae of the Malaysian area in a wider sense. VII. *Planchonella* Pierre. *Blumea* 8 (2), 1957 (235-445). Many refs. [E.] O.R.S.

Covers the entire genus, not merely species in the Malaysian area. Gives a key, description of 99 species and 4 doubtful ones, a list of 45 excluded species and an index. New species and varieties described are: *P. rheophytopsis*, *P. cotinifolia* var. *pubescens*, *P. lanatifolia*, *P. azou*, *P. lucens*, *P. macrocarpa*, *P. maculata*, *P. macropoda* var. *multinervis*, *P. cyclopensis*, *P. queenslandica*, *P. papyracea*, *P. dies-reginae*, *P. linggensis* var. *vinicolorata*, *P. ripicola*, *P. costata* var. *smithii* and var. *umbonata*, *P. pohlmaniana* var. *asterocarpon*, *P. lamii*, *P. solida*, *P. crocodiliensis*, and *P. baueri* var. *brevipedicellata*.

1433. LAM, H. J. Revision of the Sapotaceae of the Malaysian area in a wider sense. IVb. *Ganua* Pierre ex Dubard (2nd supplement). *Blumea* 8 (2), 1957 (510-3). 2 refs. [E.] O.R.S.

Additional notes from new material, including new localities for *G. beccarii*, *G. daemonica*, *G. monticola*, and *G. motleyana*, and descriptions of the fruits of *G. bourslageana* and *G. proluxa*. [Cf. *F.A.* 16 No. 176; 17 No. 188.]

1434. HERRMANN-ERLEE, M. P. M., and LAM, H. J. Revision of the Sapotaceae of the Malaysian area in a wider side [sic]. VIII. *Krausella* H. J. Lam. *Blumea* 8 (2), 1957 (446-51). Many refs. [E.] O.R.S.

Gives a key to species and describes *K. schlechteri*, *K. patentinervia* comb. nov., *K. polyneura*, *K. forbesii* and two unidentified specimens.

1435. HERRMANN-ERLEE, M. P. M., and ROYEN, P. VAN. Revision of the Sapotaceae of the Malaysian area in a wider sense. IX. *Pouteria* Aublet. *Blumea* 8 (2), 1957 (452-509). Many refs. [E.] O.R.S.

Includes a key to species, descriptions of 28 species and 8 doubtful ones, a list of 69 excluded species, and an index. New species and varieties described are: *P. luzoniensis* var. *papuana*, *P. celebica*, *P. doonsaf*, and *P. paucinervia*.

## 18. Plant Ecology

### 181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 1412, 1426-7, 1555, 1592, 1599, 1604, 2611.

1436. WORTHINGTON, N. P. Silvical characteristics of Red Alder [*Alnus rubra*]. *Silvic. Ser. Pacif. Nthwest. For. Range Exp. Sta.* No. 1, 1957. pp. 15. 21 refs.

The first of a 'silvical characteristics' series to be produced by this Station on the same lines as those being published by other Federal Stations. These compilations aim at giving information on habitat conditions, life history, including growth and yield, injuries, races and hybrids, and any special features, preliminary to eventual publication in book form. [Cf. *F.A.* 18 No. 3759; 19 Nos. 154, 159.]



1437. GODMAN, R. M. Silvical characteristics of Sugar Maple (*Acer saccharum*). *Sta. Pap. Lake St. For. Exp. Sta.* No. 50, 1957. pp. 24. 89 refs.

1438. MERZ, R. W. Silvical characteristics of Ohio Buckeye [*Aesculus glabra*]. *Misc. Release Cent. St. For. Exp. Sta.* No. 16, 1957. pp. 12. 20 refs.

1439. SANDER, I. L. Silvical characteristics of Northern Red Oak [*Quercus rubra*]. *Misc. Release Cent. St. For. Exp. Sta.* No. 17, 1957. pp. 15. 42 refs.

1440. CAMPBELL, R. A. Silvical characteristics of Scarlet Oak (*Quercus coccinea* Muenchh.). *Sta. Pap. Stheast. For. Exp. Sta.* No. 86, 1957. pp. 8. 29 refs.

1441. STROTHMANN, R. O., and ZASADA, Z. A. Silvical characteristics of Quaking Aspen (*Populus tremuloides*). *Sta. Pap. Lake St. For. Exp. Sta.* No. 49, 1957. pp. 26. 91 refs.

1442. HALLIN, W. E. Silvical characteristics of California Red Fir [*Abies magnifica*] and Shasta Red Fir [*A. magnifica* var. *shastensis*]. *Tech. Pap. Calif. For. Range Exp. Sta.* No. 16, 1957. pp. 8. 10 refs.

1443. WILLIAMSON, M. J. Silvical characteristics of Eastern Redcedar [*Juniperus virginiana*]. *Misc. Release Cent. St. For. Exp. Sta.* No. 15, 1957. pp. 14. 55 refs.

1444. COOPER, R. W. Silvical characteristics of Sand Pine (*Pinus clausa* Chapm. Vasey). *Sta. Pap. Stheast. For. Exp. Sta.* No. 82, 1957. pp. 8. 5 refs.

1445. COOPER, R. W. Silvical characteristics of Slash Pine (*Pinus elliottii* Engelm. var. *elliottii*). *Sta. Pap. Stheast. For. Exp. Sta.* No. 81, 1957. pp. 13. 28 refs.

1446. HALLIN, W. E. Silvical characteristics of Jeffrey Pine [*Pinus jeffreyi*]. *Tech. Pap. Calif. For. Range Exp. Sta.* No. 17, 1957. pp. 11. 21 refs.

1447. ROE, E. I. Silvical characteristics of Tamarack [*Larix laricina*]. *Sta. Pap. Lake St. For. Exp. Sta.* No. 52, 1957. pp. 22. 48 refs.

1448. SCHUBERT, G. H. Silvical characteristics of Incense Cedar [*Libocedrus decurrens*]. *Tech. Pap. Calif. For. Range Exp. Sta.* No. 18, 1957. pp. 14. 38 refs.

1449. GREGORY, R. A. Some silvicultural characteristics of Western Red Cedar [*Thuja plicata*] in southeast Alaska. *Ecology* 38 (4), 1957 (646-9). 4 refs.

1450. WEBB, L. S. The growth and development of Balsam Fir in Gaspe [Quebec]. *Pulp Paper Mag. Can.* 58 (10), 1957 (206-214).

Balsam Fir is the commonest species in this 9000 sq. miles of forest; in some places it makes up 90% of the stand. Its natural development from

seedling to death, its height growth and yield, the effects of storms (spread of age classes) and the importance of insect pests are described.

1451. BUFF, J. *Araucaria araucana*—ältestes Nadelholz der Welt. [*A. araucana*, the oldest existing conifer species.] *Holz-Zbl.* 83 (134), 1957 (1627). 3 refs. [G.]

Distribution, range, growth, wood uses etc.

1452. BUFF, J. *Fitzroya cupressoides*—der chilenische Mammutbaum. [*F. cupressoides*.] *Holz-Zbl.* 83 (149), 1957 (1814). [G.]

Describes distribution, habit, longevity, wood properties (particularly durability and dimensional stability), exploitation.

1453. PARDE, J. Plaidoyer pour le mélèze. [*A plea for the Larch*.] *Rev. for. franç.* 9 (8/9), 1957 (634-51). 24 refs. [F.g.]

Discusses the natural distribution, silvicultural characters etc. of European Larch and presses for its use in French afforestation programmes on suitable sites. A list is given of suitable provenances for low or medium altitudes.

1454. MERENDI, A. Il pino cembro. [*Pinus cembra*.] *Ital. agric.* 94 (8), 1957 (659-69). [It.] E.M.B.

Distribution and silvicultural characters, with a short note on wood properties.

1455. MERENDI, A. Pino laricio di Calabria. [*Pinus nigra* var. *calabrica*.] *Ital. agric.* 94 (11), 1957 (1033-46). [It.] E.M.B.

Distribution, silvicultural characters etc.

1456. Numero speciale dedicato a latifoglie varie (seconda parte). [*Special number devoted to various broadleaved species (Part 2)*.] *Monti e Boschi* 8 (11/12), 1957 (485-606). [It.]

[Cf. F.A. 17 No. 1303; 18 No. 1357.] Contains a number of articles covering botanical and silvicultural characters, wood properties and uses, and pests of the following species grown in Italy: *Ficus carica*, *Nerium oleander*, *Sambucus* spp. (*C. Arretini*); the Rosaceae (*R. Corti*); *Prunus avium*, *P. cerasus*, *P. padus*, *Crataegus oxyacantha*, *C. azarolus*, *Sorbus* spp. (*R. Corti* and *A. Pavari*); *Laurus nobilis*, *Buxus sempervirens*, *Tamarix gallica*, *T. africana* (*G. Gambi*); *Platanus orientalis*, *Cornus mas*, the Ericaceae (*E. Magini*); *Juglans regia*, *Pistacia terebinthus*, *P. lentiscus* (*R. Morandini*); *Olea europaea* subsp. *oleastro* (*A. Morettini*); *Chamaecyparis humilis*, *Ceratonia siliqua*, *Ilex aquifolium*, *Rhamnus alaternus*, *Phillyrea* spp. (*A. Pavari*); the Leguminosae (*L. Susmel*).

1457. JOACHIM, H. F. Beobachtungen und Untersuchungen an Balsampappeln. [*Observations and investigations on Balsam Poplars*.] *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (Beitr. Pappelforsch. No. 2), 1957 (35-73). 77 refs. [G.g.]

A discussion of the section *Tacamahaca*, concentrating on *Populus trichocarpa* (a) and *P. candicans* (b) on the basis of the literature and the author's own observations, covering original habitats, distribution in Europe and particularly E. Germany, phenology,



morphology, and biotic and abiotic injuries. Contrary to W. European experience, the author found (a) comparatively resistant to canker. It was, however, more susceptible to *Dothichiza populea* and rust than Black Poplar hybrids. Growth results and susceptibility to injuries of (a) and (b) are compared with those of various hybrid Black Poplars on 20 E. German sites, most of the trees being between 15 and 30 years old; (b) did less well than Black Poplars on all sites, while (a), though inferior on river bottomlands and on spoil-mounds or other dry sites, did well on low-lying groundwater sites. Because of its high susceptibility to pests and diseases its cultivation is, however, not recommended.

1458. KRISHNASWAMY, V. S. Cashewnut *Anacardium occidentale* (Linn). Madras Forest Department. 1957. pp. 9. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses its distribution, habit, site and climatic requirements, natural regeneration, propagation, tending, pests, rotation and yield, and processing of the nuts, and gives figures showing export value.

1459. HUNDLEY, H. G. Kanyin: *Dipterocarpus species*. *Burmese For.* 7 (1), 1957 (77-82 + 8 photos). 7 refs.

Silvicultural characters, wood properties, and means of distinguishing *D. alatus*, *D. baudi*, *D. costatus*, *D. dyeri*, *D. grandiflorus*, *D. kerii*, *D. macrocarpus*, *D. pilosus*, and *D. turbinatus*.

1460. KADAMBI, K. The silviculture of *Calophyllum inophyllum* Linn. *Indian For.* 83 (9), 1957 (559-62 + 1 photo, 1 map). 26 refs.

Botanical description, distribution, silvicultural characters, regeneration, and uses.

1461. KADAMBI, K. *Calophyllum tomentosum* T. Anders, syn. *C. elatum*, Bedd. *Indian For.* 83 (10), 1957 (608-13 + 1 photo, 1 map). 32 refs.

Distribution, silvicultural characters, and wood properties.

1462. JAEGER, P., and LECHNER, E. Observations et réflexions au sujet du biotope du Kololo (*Gilletiodendrum glandulosum* (Port.) J. Léonard, Césalpiniacées. (Observations and reflections on the biotope of *G. glandulosum* [in western Sudan].) *C.R. Acad. Sci., Paris* 245 (10), 1957 (944-6). [F.] O.R.S.

1463. RUYSEN, B. Le karité au Soudan. [*Butyrospermum parkii* in the Sudan.] *Agron. trop.* 12 (2; 3; 4), 1957 (143-72; 279-306; 415-40). [F.f.e.span.]

Botanical description, ecology, silvicultural characters, production, harvesting, and processing of fruit, and marketing of the "butter".

### 181.1. Distribution, Natural Range

See also No. 1513.

1464. BOISELLE, R., and OBERDORFER, E. Der Pfälzer Wald, ein natürliches Verbreitungsgebiet der Kiefer. [The Pfälzer Wald, part of the natural

range for Pine.] *Allg. Forst- u. Jagdztg.* 128 (10/11), 1957 (212-9). 27 refs. [G.]

The first author contends that Pine is natural to the region, a view not shared by most of the older writers on the subject, mainly by quoting from survey records of the early 17th century. In support the second author describes two Oak/Pine associations—a *Quercetum peucedanetosum* on steep, stony, southern slopes in the E. part, and a *Vaccinio-vitis-idaeo-Quercetum* in the central part of the region, though he stresses the predominance of broadleaved forest types generally in the area.

1465. THIÉBAUD, M. Répartition des espèces du genre *Quercus*, plus spécialement de *Q. cerris* dans la région biennoise. [The distribution of the genus *Quercus*, and particularly of *Q. cerris*, in the region of Bienne.] *Bulletin de la Société Neuchâteloise des Sciences Naturelles, Neuchâtel (Sér. 3)* 76, 1953 (23-44). 14 refs. [F.g.e.] M.U.

Incidentally describes 6 hybrids, including *Q. pubescens* × *Q. sessiliflora* × *Q. robur*.

1466. BUCHINGER, M., and FALCONE, R. *Cedrela mexicana* M. J. Roemer, especie nueva para la Flora Argentina. [*C. mexicana*, a species new to the Argentine flora.] *Darwiniana, B. Aires* 11 (2), 1957 (290-2). 5 refs. [Span.] A.P.B.

Notes on specimens found in Misiones. This is an extension of the range of the species, as known hitherto.

### 181.2. Atmospheric Relations. Acclimatization

See also Nos. 1277-8, 1354, 1375, 1493, 1595 et seq., 1852 et seq., 2143.

1467. Investigation of the photo-period response and racial variation in Loblolly Pine. *Res. Rep. Fla. Sch. For.* No. 4, 1957 (21-2).

Weekly measurements of height growth were made for 2 years on plots of *Pinus taeda* of 30 geographic origins at Gainesville, Florida, when subjected to (a) natural Florida day-length, (b) day-length extended by floodlights to duplicate that of Worcester County, Maryland (the most northerly provenance tested). Plants of Maryland origin in plot (a) started growth 6 weeks later and ceased 8 weeks earlier than those of local origin and their total height growth was only 35% of that of Florida plants. On plot (b), however, they grew for 2 months longer than on (a) and total height growth was 70% of that of Florida provenances. The Florida provenances were unaffected by day-length, while other provenances gave responses intermediate between the two extremes described. A distinct clinal pattern correlated with frost-free season and latitude of origin is evident in the data examined.

1468. Genetic variation in the winter chilling requirements of Red Maple. *Res. Rep. Fla. Sch. For.* No. 4, 1957 (23-4).

*Acer rubrum* is found from Northern Canada to Southern Florida. The frost-free period in this area ranges from 365 to < 80 days. Collections of seedlings from different points in this range were subjected to varying amounts of cold treatment, and



genetic variation in the amount of cold required for normal break of dormancy was clearly demonstrated. Plants from S. Florida have no chilling requirement, while those from Northern New York need a month's treatment. The pattern of genetic variation is clinal and is correlated with the frost-free season of the area where the seed was collected.

### 181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 1286, 1290-7, 1308, 1342, 1348-50, 1554, 1762, 2277-8.

1469. SATOO, T. [Drought resistance of some conifers at the first summer after their emergence.] *Bull. Tokyo Univ. For.* No. 51, 1956 (1-108). 167 refs. [Jap.jap.e.e.]

Seedlings of *Pinus densiflora*, *Cryptomeria japonica* and *Chamaecyparis obtusa*, were examined in detail for drought resistance. It is concluded that the most important factors determining drought resistance in these 3 species are the magnitude of cuticular respiration and the development of the root system. The former is lowest and the latter largest in the Pine, which is the most drought-resistant of the three.

1470. BUTIN, H. Die jahreszeitlichen Wassergehaltsschwankungen und die Verteilung des Wassers in Stecklingen und im Stamm 2-jähriger Pappeln. [The seasonal fluctuations in moisture content and the distribution of moisture in Poplar cuttings and in the stem of 2-year Poplar plants.] *Ber. dtsh. bot. Ges.* 70 (4), 1957 (157-66). 21 refs. [G.g.] O.B.D.

Moisture relations were determined over the space of a year in various species and varieties. Definite seasonal fluctuations were found, with a maximum water content in May (cuttings) and June (2-year plants), and a minimum in Sept./Oct. From early March to September, m.c. values rise from the base of the stem to the shoot tip. In winter this state is reversed. Amounts of precipitation seem to have no direct effect upon the m.c. pattern.

1471. ROOSEN, P. La teneur en eau des tiges de peupliers eurafricains en Belgique. [Water content of stems of hybrid Black Poplars in Belgium.] *Bull. Inst. agron. Gembloux* 25 (1/2), (179-97). 8 refs. [F.f.] E.M.B.

The water content of standing Poplars is high in comparison with other woody species; the average is 174% of the dry weight of the wood, with extreme values ranging from 96 to 254%. Contrary to what is found in most other woody species, the sapwood is drier than the heartwood. The average water content decreases slightly from the base to the apex of the stem, the reduction being more marked in the heartwood. The average water content depends on the variety. In descending order of water content they may be ranged as follows: *Populus × regenerata*, *P. × serotina*, *P. × robusta* and *P. × marilandica*. On wet sites, m.c. is higher, and the difference between sapwood and heartwood is reduced. The average m.c. decreased in general from the beginning to the end of the year, the reduction affecting the transverse zones in differing degrees. Observations on a small

number of stems showed no effect of frost-crack on m.c.

1472. LEAF, A. L. **Diagnosis of deficiencies of available potassium, calcium, and magnesium in forested soils.** *Abstr. of thesis, in Dissert. Abstr.* 17 (9), 1957 (1859). O.R.S.

In the initial phase of the study, relating the nutrient content of soil to the growth of plantations of Red Pine in Wisconsin, and Scots Pine and Norway Spruce in Finland, no significant correlation was found between growth and content of available bases as determined by extraction with neutral *N*  $\text{NH}_4$  acetate. Other more effective methods were investigated, their relative value being determined on the basis of analyses of some New York and Wisconsin soils whose response to fertilizer treatment had already been established, and by analyses of feldspathic minerals. Extraction with neutral *N*  $\text{NH}_4$  acetate following ignition of  $\text{NH}_4$ -saturated soil at 500° C., or with boiling *N* nitric acid, provided results best correlated with the base requirements of trees as detected by the rate of growth and response to fertilizer. Analysis of foliage from stands belonging to a wide range of site indices failed to show significant differences in the concentrations of the 3 cations studied. In some instances, the concentration of bases in foliage of Pine plantations growing on infertile aeolian sands was as high as that in foliage of rapidly growing plantations on very fertile soils. The foliar analyses were made on the current year's needles from terminal shoots. The P concentration of litter from screen traps was much lower than in the current year's foliage, but the reverse was true of Ca. Concentration of Mg was not significantly different in litter and needles. The efficiency of tree root systems in extracting nutrient elements from unweathered minerals was demonstrated by results of incubation of biotite with sloughings of Red Pine roots. After 5 months in a 30° C. humidity chamber, the biotite released 38% of the total P in exchangeable form, as compared with only 8% released in the absence of root tissues. Similar trends were observed in regard to the effect of root tissues on microcline, syenite and other feldspathic minerals.

1473. WEHRMANN, J. Die Stickstoffgehalte von Fichtennadeln in Abhängigkeit von der Stickstoffversorgung der Bäume. [The N content of Spruce needles in relation to the N supply of the trees.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (62-72). 20 refs. [G.g.]

A comparison of needles of 20-year Spruce that had received N as  $(\text{NH}_4)_2\text{SO}_4$  at rates per ha. of (A) 240 kg., (B) 40 kg. and (C) nil in May 1955. Samples of needles of the current and the previous year's growth were taken at 4-weekly intervals during 1955-56 from (a) the top whorls, (b) the 3rd and 4th, and (c) the 6th and 8th whorls. In spite of a considerable scatter of values between individual trees of each treatment group, mean N-content values, based on 24 or 10 trees, showed significant differences, which were most marked in the current year's needles from (a), where values of (A) were ca. 40%, and values of (B) ca. 20%, higher than those of



(C). In needles of the current year, the concentration decreased from the top downwards, so much so that needles from (A) (c) had about the same N content as needles from (C) (a). In the previous year's needles, the highest concentrations were in (b).

1474. KELLER, T. **Physico-chemical conditions of podzolized soils hindering the growth of exacting hardwoods.** *Abstr. of thesis, in Dissert. Abstr.* 17 (9), 1957 (1857-8). O.R.S.

Results of a study on a variety of soils and stands in 11 counties of N. Wisconsin allowed the subdivision of hardwood stands (*Acer saccharum*, *Tilia americana*, *Ulmus americana* and *Fraxinus americana*) into 3 soil-stand types characterized by average site indices of 70, 62 and 54. Physical analyses established 2 significant critical conditions precluding reasonably fast growth of hardwoods: (1) insufficient water-retaining capacity of the soil, caused by deficiency of mineral colloids, and (2) impermeability of the B horizon in strongly podzolized soils, leading to excess moisture in the soil profile, inadequate aeration and subsequent development of shallow root systems, the last feature being largely responsible for damage during severe drought. Determination of available nutrients indicated the following requirements in the top 6-in. layer for sound development of second-growth hardwood stands: minimum pH 5.3, cation exchange capacity 10 m.e./100 g., total N 0.2%, available P ( $P_2O_5$ ) 35 p.p.m., available K ( $K_2O$ ) 75 p.p.m., exchangeable Ca 4 m.e./100 g., exchangeable Mg 0.5 m.e./100 g. Despite logging and fire, the composition of the ground cover is an indicator of site quality. The annual return of nutrients, as given by total oven-dry weight of leaf fall and concentration of nutrient elements, was closely related to site quality; analysis of fresh litter may serve as an indicator of the supply and balance of available nutrients.

1475. VAGELER, P. **As exigências de nutrientes dos eucalyptos.** [The nutrient requirements of Eucalypts.] *Brasil madeireiro* 12 (120), 1957 (30-1). [Port.]

Presents the results of analyses of the N,  $P_2O_5$ ,  $K_2O$ , MgO and CaO contents of roots, stem, and foliage of Eucalypts growing in Brazil, and discusses on this basis their soil requirements.

1476. TSING, T., FANG, Y.-H., and WANG, W.-L. **[Salt tolerance of some popular trees in North Kiangsu.]** *Acta Botanica Sinica* 5 (2), 1956 (153-76 + 10 photos). 29 refs. [Chin.chin.e.] L.S.

Describes experiments with 23 species to find trees or shrubs suitable for windbreaks and shelterbelts in the coastal area of the province, where the soil is highly saline. In germination tests in glazed pots containing soils with NaCl added and kept suitably moist, *Melia azedarach* could germinate and survive at a salt content of 0.6%, while at 0.25%, first-year growth was comparable to that of controls. For *Ailanthus altissima* the relative levels for germination, survival and good growth were 0.5, 0.3 and 0.3 and for *Sapium sebiferum* (a) 0.6, 0.4 and 0.2% respectively. *Robinia pseudoacacia* (b), *Gleditsia*

*sinensis* (c), *Sophora japonica* (d), *Amorpha fruticosa* (e) and *Thuja orientalis* were less tolerant, *Juglans regia*, *Catalpa ovata* and *Celtis julianae* even less so, while *Quercus acutissima* and some others proved intolerant. When 1- to 2-year-old nursery plants of 10 species were transplanted into soil of graded salinity, (b) showed the highest tolerance, followed by (c), (d), (e) and *Ulmus pumila* (f). Judged by the number and growth of shoots produced, root cuttings of (f) and stem cuttings of *Tamarix chinensis* were also highly tolerant. Preliminary experiments with seedlings of (a) and (d) suggest that if relatively high concentrations (e.g. 0.4%) are reached by gradual additions of salt, the damage to the seedlings would be reduced. Earlier literature on salt tolerance, particularly differences at successive growth stages, is discussed and some practical recommendations are made. *From authors' summary.*

1477. UEMURA, S., et al. **[Studies on the nutritional conditions and the growth of soil-improving trees (nodule-bearing trees). I. Some experiments on the water culture of Black Wattle (*Acacia mollissima*) and Alder (*Alnus sieboldiana*) in different nutritional conditions.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 99, 1957 (1-24 + 30 photos). 7 refs. [Jap.jap.e.e.]

Describes the growth (May-October) and the deficiency symptoms of seedlings raised in baskets of quartz sand, half immersed in nutrient solutions of various composition, a part of each lot being inoculated with root-nodule bacteria.

1478. BOND, G. **The development and significance of the root nodules of *Casuarina*.** *Ann. Bot.* 21 (83), 1957 (373-80 + 1 plate). 15 refs. O.R.E.

Young plants of *Casuarina cunninghamii* and *C. equisetifolia* in water culture developed macroscopic nodules in 26 to 35 days from inoculation, nodulation falling off at pH less than neutrality (the optimum) much more rapidly than in other non-legume nodule-forming genera. Nodulated plants, but not controls, grew vigorously in culture solutions free from combined N. Fixation of atmospheric N by *C. cunninghamii* during 6 months of active growth amounted to ca. 50 mg./plant. Roots springing from nodule lobes grew upwards, like those in *Myrica gale*. *From author's summary.*

1479. BOND, G. **Isotopic studies of nitrogen fixation in non-legume root nodules.** *Ann. Bot.* 21 (84), 1957 (513-21). 16 refs. O.R.E.

Studies with  $N^{15}$  confirmed the fixation of atmospheric N by the nodules of species of the genera *Casuarina*, *Ceanothus* and *Shepherdia*. N fixation in detached nodules of *Alnus* sp. and *Hippophaë [rhamnoides?]* continued longer than in detached leguminous nodules. Lessening the amount of O in the atmosphere had no effect on N fixation by *Myrica [gale?]* nodules until it fell below 5%.

1480. BERGEMANN, J. **Das Mykorrhiza-Problem in der Forstwirtschaft.** [The mycorrhiza problem in forestry.] *Allg. Forstzeitschr.* 11 (23/24), 1956 (297-304). 39 refs. [G.]

A review designed to summarize for the practical



forester the present state of knowledge and the practical implications of research results for growth problems in nurseries, forest plantations, afforestation of steppes, moors, wasteland etc., and in existing stands. Some of the literature cited is additional to that cited in the author's earlier review [see *F.A.* 15 No. 1172].

1481. LEVISOHN, I. **Differential effects of root-infecting mycelia on young trees in different environments.** *Emp. For. Rev.* 36 (3), 1957 (281-6). 9 refs.

1482. FRITSCH, K. Untersuchungen an Mycorrhizen der Weisstanne im Südschwarzwald unter Berücksichtigung der Bodenazidität. [Mycorrhizae of Silver Fir in the S. Schwarzwald, with special reference to soil acidity.] The author, Forest Department, Langenburg, Württemberg. 1956. pp. 102 + 26 tpls. [G.g.] Price [£1. 4s.]

Describes investigations on 134 samples (pH values 3.5-6.5) from 5 districts, collected at various seasons of the year. Mycorrhizae were found on all short and many long roots of all Silver Firs in humus-containing soils, but in layers without humus (A<sub>2</sub> and B horizons) neither short roots nor mycorrhizae. It would therefore seem impossible for Silver Fir to improve podzolized soils through its root metabolism. Development of mycorrhizae started before shoot development and reached its maximum after the end of the growing season. Eight main root types were distinguished macroscopically, the morphology and mycorrhizal development of which are described and illustrated with coloured drawings and photomicrographs. No connexion between pH values and mycorrhizae was found within the range examined. *From author's summary.*

1483. MELIN, E., and NILSSON, H. **Transport of C<sup>14</sup>-labelled photosynthate to the fungal associate of Pine mycorrhiza.** *Svensk bot. Tidskr.* 51 (1), 1957 (166-86). 32 refs. [E.e.] O.B.D.

Seedlings of *Pinus sylvestris* were cultured aseptically in Erlenmeyer flasks and inoculated with mycelia from pure cultures of a mycorrhizal fungus viz. *Rhizopogon roseolus* or *Boletus variegatus*. When the mycorrhizae had formed, the seedlings were exposed for 1 hour to an atmosphere containing C<sup>14</sup>-labelled CO<sub>2</sub>. The seedlings were left for 5 hours and the hyphal mantles of the mycorrhizae then detached and examined. Tissue samples were converted to CO<sub>2</sub> and the gas analysed for the presence of radiocarbon. The equipment and methods are described and results presented. The rapid transport of labelled photosynthate and its conversion products to both the root tips and the mycorrhizal mantle was demonstrated.

1484. LINNEMANN, G., and MEYER, H. **Mykorrhiza und Phosphormangel.** [Mycorrhizae and P deficiency.] *Forst- u. Holzw.* 13 (1), 1958 (8-10). 3 refs. [G.]

Investigation into the causes of purple discoloration of 2-year Pine, planted out as 1-year seedlings from a commercial nursery, showed these to have few or no mycorrhizae, whereas plants from a forest nursery were vigorous and green, and had

abundant mycorrhizae. It is suggested that the abundance of nutrients in the commercial nursery inhibited mycorrhizal growth and so handicapped the plants when transferred to a poorer environment.

1485. WRIGHT, E. **The importance of mycorrhizae to Ponderosa Pine seedlings.** *For. Sci.* 3 (3), 1957 (275-80). 12 refs.

Demonstrates the inferiority of field plants without mycorrhizae, derived from beds fumigated against *Fusarium* root rot, and describes pot inoculations of Ponderosa seedlings with *Xerocomus* sp. (Boletaceae), frequent in *P. ponderosa*/*Abies lasiocarpa* stands.

1486. HAWKER, L. E., and HAM, A. M. **Vesicular-arbuscular mycorrhizas in Apple seedlings.** *Nature, Lond.* 180 (4593), 1957 (998-9). 4 refs.

The formation of such mycorrhizae in Apple seedlings grown in sterilized soil to which sporocarps of an *Endogone* sp. had been added, has been described [cf. *F.A.* 18 No. 3787]. The present authors have shown that a similar endophyte in the roots of several herbaceous plants is a *Pythium* sp. closely resembling *P. ultimum*, and inoculation of Apple seedlings with it, produced effects very similar to those associated with *Endogone*. It is suggested that the *Pythium* may have been present in or on the unsterilized sporocarps of *Endogone*.

1487. REDMOND, D. R. **Observations on rootlet development in Yellow Birch.** *For. Chron.* 33 (3), 1957 (208-12). 4 refs.

Under a closed stand, the presence of organic material is more important than the prevailing temperature in determining whether a specific volume of soil is occupied by Yellow Birch rootlets. Most of the organic matter under stands containing Birch in the Maritime Provinces [of Canada] is found in the humus layer, which is rarely > 6 cm. thick. In pure hardwood stands containing a high % of Yellow Birch, > 75% of the rootlets were found in the humus layer. In hardwoods containing less Birch, or in stands containing a high % of conifers, > 90% of the Birch rootlets were in the humus. [Cf. *F.A.* 17 Nos. 1825-6.] *Author's summary.*

1488. OPPENHEIMER, H. R. **Pénétration active des racines de buissons méditerranéens dans les roches calcaires.** [Active penetration of roots of Mediterranean scrub into limestone rocks.] *Bull. Res. Coun., Israel* 5D (2/3), 1956 (219-22 + 9 photos). 3 refs. [F.e.]

Tree species of the maquis (*Pistacia lentiscus*, *P. palaestina*, *Rhamnus palaestina*, and *Pinus halepensis*) are pioneers on bare rock with mosses, lichens and dwarf shrubs. Some dissolve limestone by acid root-secretions, the first-named seemingly playing a major role in this activity on Mt. Carmel (Israel).

1489. OPPENHEIMER, H. R. **Further observations on roots penetrating into rocks.** *Bull. Res. Coun., Israel* 6D (1), 1957 (18-31). 8 refs.

Describes, with microphotographs, the root anatomy of *Pistacia lentiscus*, *Quercus calliprinos*, *Rhamnus palaestina*, *Ceratonia siliqua*, and *Phillyrea*



*media*, emphasizing diagnostic features. On Mt. Carmel, the major role of *P. lentiscus* in penetrating originally unfissured soft rock [see preceding abstract] is confirmed. This and *R. palaestina* after germinating in very small depressions may finally crack the rock. Oak seems to have a secondary, and Carob, little, part in this activity.

1490. Å., H. Hur förhindra trädrötter att tränga in i dräneringsledningar? [How can one prevent tree roots from penetrating drain pipes?] *Jord-Gröda-Djur, Svensk Jordbruksforskning: Årsbok, Stockholm* No. 11, 1955 (63). [Sw.] C.G.B.

In experiments in Denmark, penetration has been completely prevented by covering pipes first with the usual thin layer of gravel or sand, and outside, a layer of dry clay 1.5 cm. thick to which iodine at the rate of 1 kg./100 kg. clay has been added, e.g. in solution in methylated spirit, which evaporates and leaves the iodine in the clay.

1491. KULLMANN, A. Die Abhängigkeit der Bewurzelung von den Standortbedingungen bei *Molinia caerulea*. [The dependence of the rooting of *M. caerulea* on site conditions.] *Arch. Forstw.* 6 (5/6), 1957 (313–29). 34 refs. [G.g.]

Illustrates its plasticity in rooting (all within the specific character range) according to age and site (particularly soil moisture). Root studies in the *Stipetum* and *Molinietum* (using Weaver's method) show that a community may be characterized not only by the aerial but also by the subterranean habit of its plants.

#### 181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 1348, 1524, 1682, 2132.

1492. KORSTIAN, C. F., and BILAN, M. V. Some further evidence of competition between Loblolly Pine and associated hardwoods. *J. For.* 55 (11), 1957 (821–2). [See *F.A.* 17 No. 3729.]

1493. ZUBAREV, V. M. K voprosu o vzaimootnošenii duba i eli. [On the interactions of Oak and Spruce.] *Dokl. Akad. Nauk SSSR* 115 (3), 1957 (616–8). 11 refs. [Russ.] A.P.B.

Studies made near Krasnoufimsk, Urals, in a 95- to 100-year Oak/Spruce stand (*Piceeto-Quercetum aegopodiosum*) show that the Spruce—a recent colonist—is replacing the Oak by creating light and soil conditions unfavourable to its development. In spite of plentiful Oak seedlings, the lower storeys and young growth consist almost entirely of Spruce. Data are also given on the height, diameter and volume increment of sample trees of Oak in (a) a mixed Oak/Spruce stand and (b) a neighbouring pure Oak stand; 15-year-old Oak was 7 m. higher, with a much greater diam. increment, in (b) than in (a). Stem analyses of two trees showed that a Spruce, 36 years old, had already outgrown its neighbour, an Oak that was 30 years old when the Spruce germinated.

1494. JOACHIM, H. F. Über den Einfluss des Sandrohrs (*Calamagrostis epigeios*) auf das Wachstum der Pappel. [The influence of *C. epigeios* on

the growth of Poplar.] *Forst u. Jagd Spec. No. Die Pappel* II, 1957 (7–12). 19 refs. [G.g.]

Describes its adverse influence on early growth and survival of Poplars planted on otherwise suitable sites. On two plots planted after full cultivation, one, which was free from the grass, had losses of ca. 19.9% and a mean d.b.h. of 4.14 cm. after 7 years, while the other, which had been re-invaded, had 56.9% losses and a mean d.b.h. of 2.68 cm. Height differences were small. Root systems on the infested site were shallower and more extensive. Repeated deep cultivation is still the best method of control.

#### 181.5. Reproductive Behaviour

See also Nos. 1393–4, 1398, 1469, 1576 *et seq.*, 1626 *et seq.*

1495. ANDRESEN, J. W. Precocity of *Pinus rigida* Mill. *Castanea* 22 (3), 1957 (130–4). 6 refs.

Gives examples of early flowering, cone and seed production by *P. rigida* in S. New Jersey: ♂ flowers were found as early as 22 months after germination, and ♀ flowers at 24 months. Some seedlings had mature, fully formed cones at the end of the 4th growing season; two of these gave seed with a germinative energy (9 days) of 52%. The viable seed produced healthy seedlings.

1496. PARAG, Y., FEINBRUN, N., and TAS, J. Study of atmospheric pollen in Jerusalem in 1953–54. *Bull. Res. Coun., Israel* 6D (1), 1957 (5–17). 17 refs.

Data (given as pollen grains/sq. cm./day) show the main contributors to be *Cupressus* and *Pinus* spp., *Poterium spinosum* (predominant in locally extensive areas of the dwarf-shrub association), *Morus nigra*, Olive, and grasses and, in much smaller amounts, *Casuarina cunninghamiana* and *Ceratonia siliqua*. Pollen of the entomophilous Olive was abundant; that of the anemophilous *Quercus* and *Pistacia* of the local maquis, scarce.

1497. STRAND, L. Pollen dispersal. *Silvae Genet.* 6 (5), 1957 (129–36). Many refs. [E.g.g.f.]

Discusses theoretical aspects and presents some findings on pollen dispersal (1) from an isolated Spruce, (2) on steep hillsides, and (3) from a forest margin.

1498. FIELDING, J. M. Notes on the dispersal of pollen by Monterey Pine. *Aust. For.* 21 (1), 1957 (17–22). 5 refs.

A continuous record of pollen dispersal throughout the season was made in 1953 in a *Pinus radiata* plantation, using the pollen recorder developed by Sarvas [cf. *F.A.* 16 No. 237]. Pollen shedding began on 7 Sept. and continued for 6 weeks. The amount of pollen in the air varied greatly from day to day in an irregular fashion, but usually followed a daily trend from a maximum in the early afternoon to a minimum or zero at night. Only a small amount was released in the first week, the bulk of it being shed during the following 19 days. The environmental factors affecting dispersal were wind force, temperature and humidity.

1499. Pollen dispersion studies. *Res. Rep. Fla. Sch. For.* No. 4, 1957 (17).

A pilot study was established in 1956 to investigate



the dispersal of pollen from isolated trees and stands of Southern Pines, in order to determine how wide an isolation strip is necessary to protect seed orchards from undue contamination. In some weather, pollen was trapped at distances of > 1000 ft. from the nearest source, but in normal conditions little or no contamination is to be expected from sources > 500 ft. away from an orchard. The data collected indicate that pollen flies further over land covered by sparse stands of trees than it does over cleared land, which supports the opinion that atmospheric turbulence plays a greater rôle than wind velocity in the dispersal of pollen.

1500. SARVAS, R. **Investigations into the dispersal of Birch pollen with a particular view to the isolation of seed source plantations.** *Commun. Inst. for. Fenn.* 46 (4), 1956 (1957). pp. 19. 20 refs. [E.e.fi.]

A study was made in an area of Pine seedling regeneration surrounded by stands containing plenty of Birch (*Betula pubescens* and *B. verrucosa*). It is concluded that had a Birch seed orchard existed in the centre of the area studied (isolation distance ca. 400 m.), only 5% of its seed crop would have resulted from outside pollination.

1501. CUNNINGHAM, T. M. **Seed production and seed fall of *E. regnans* (F. Muell.).** *Aust. For.* 21 (1), 1957 (30-9 + 3 photos). 5 refs.

The pattern of development of mature capsules of *Eucalyptus regnans* from inflorescence primordia is described, and a method given for studying the natural fall of Eucalypt seed. The results of studies with *E. regnans* and *E. obliqua* over 5 years are presented, including curves showing times of peak seed-fall. Estimates are given for *E. regnans* of the amount of seed-fall under various degrees of crown closure, and the results of two studies on the dispersal distance. *From author's summary.*

1502. ČELJADINOVA, A. I. **Prispособitel'noe značenie perioda pokoja u semjan drevesnyh rastenij. [The adaptive significance of the period of dormancy in tree seed.]** *Agrobiologija* 1957 (2), (94-100). 8 refs. [Russ.] I.M.I.

The author discusses briefly the germination requirements of seed of various species of the N. temperate zone and, in greater detail, the significance of after-ripening and dormancy, and the physiological processes involved. On the basis of germination tests with seed of *Acer tataricum* and *Fraxinus excelsior*, species germinating with difficulty, it is shown that the period of cold stratification necessary to break dormancy varies with the condition and quality of the seed; this period will be shorter if the after-ripening processes have been completed. The duration of the dormant period may vary for seed of the same provenance and for seed from the same tree by  $\geq 30$  days. After cold stratification at 0-5° C. seed of many woody species will germinate at that same temperature. Raising the temperature to ca. 20° after such stratification will considerably hasten germination, but only if the seeds have completed their period of dormancy; if they have not done so, the temperature rise will cause a re-entry into dormancy, so that the seeds may require a

second stratification for as long a time as if they had not been stratified before. In the author's opinion these data show that the processes involved in breaking dormancy are reversible, and that stratification is not a 'stadial' process like vernalization (which takes place only in embryos that have begun to grow, whereas stratification prepares the embryo for growth). [Cf. *F.A.* 19 No. 1645.]

1503. ASAKAWA, S. **On the water absorption by *Pinus koraiensis* seeds.** *J. Jap. For. Soc.* 38 (4), 1956 (125-9). 11 refs. [E.e.jap.]

Absorption takes place in 3 phases: (1) rapid increase in weight during the first few days; (2) little or no change over a period of several months; (3) a further increase nearly equal to (1). The effect of removing part or the whole of the testa and the inner coat was studied, and results are shown in graphs. When the whole testa was removed, phase (2) lasted only a few days, and with both the testa and inner coat removed, it was not observed in the majority of seeds. Seeds that failed to germinate without their testas are thought to have had dormant embryos. Removal of the testa from the side touching the seedbed favoured rapid absorption, but the endosperms of all seeds so treated decayed within 2 weeks, presumably because of excess of water and insufficient O. The length of phase 2 in intact seeds is attributed to mechanical resistance of the testa.

1504. Goo, M. **[A physiological study of germination of coniferous seed by the application of water absorption curve.]** *Bull. Tokyo Univ. For.* No. 51, 1956 (159-236). 64 refs. [Jap.jap.e.e.]

A detailed study (18 tables, 58 graphs) based on the 3-segment absorption curve [see *F.A.* 13 No. 1049] reviewing work already noticed in *F.A.* and adding to it in content and species covered, the latter including (1) *Cryptomeria japonica*, (2) *Pinus densiflora*, (3) *P. thunbergii*, (4) *P. strobus*, (5) *Picea jezoensis*, (6) *P. glehnii*, (7) *Tsuga sieboldii*, and (8) *Chamaecyparis obtusa*; (7) did not show the normal 3-segment curve. Subjects covered are a comparison of the curves for slow and rapidly germinating seed of (1); water absorption nearly proportional to area of seed-coat in contact with water (3) [see *F.A.* 14 No. 2026]; curves differing as between seed trees (1), (2) and (3); proportion by weight in coat, endosperm and embryo differing in heavy and light seed (2) and (3); comparison of water absorption by embryo and endosperm after the first segment (coat absorption) of the curve. Part II (taking cognizance of the seed-tree and seed-weight effects) deals with the suction force of the seed cell-sap [see *F.A.* 15 No. 3356]; desiccation at different germination stages and recovery from it; temperature and water absorption, and temperature and germination (1), (2), (3) and (8); autumn and spring sowing, stratification, and sowing of seed with and without extruded radicles (1), (2), (3) and (8); effect on germination of exposure to air at different germination stages; oxygen consumption of seed [see *F.A.* 18 No. 3800]; effect of light on water absorption [see *F.A.* 15 Nos. 3359-60] in (1), (2) (3) and (8); water absorption and changes in



seed (in segment 3 of curve, from cracking of seed-coat to appearance of radicle), including the first cell division of various parts [see *F.A.* 14 No. 1936] and the later distribution of reserve foods [see *F.A.* 14 No. 1935; 18 No. 3799].

1505. MILLER, S. R. **Germination of Slash Pine seed following submergence in water.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 3, 1957. pp. 2.

Lots of 100 seeds each of *Pinus elliottii* var. *elliottii* were placed in wire baskets and submerged under water in a flooded area, and samples were taken up at intervals and sown in boxes. Normal germination % decreased rapidly and consistently with increases in length of submergence, being reduced by 50% after 3-4 weeks' submergence. Very little germination occurred after 8-12 weeks and none after 16 weeks. It is concluded that direct sowing should not be done on areas likely to be flooded for more than a few weeks.

#### 181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 1385, 1388, 1751, 2132, 2140, 2142-4, 2163, 2265.

1506. MESSERI, A. Appunti sulle caratteristiche morfologiche di un individuo di *Eucalyptus camaldulensis* Dehn. [Notes on morphological features of one tree of *E. rostrata*.] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (65-74 + 8 photos). 4 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

With particular reference to crown form, the shedding of branches, resulting branch stubs and knots, and the formation of epicormic shoots.

#### 181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also Nos. 1673, 2605.

1507. MITCHELL, A. F. **List of tallest and largest commoner trees recorded [in Britain] since 1947.** *Quart. J. For.* 51 (4), 1957 (333-6).

Gives height, g.b.h., and location for individuals of 100 species.

1508. ROHMEDER, E. **Altersphasenentwicklung der Waldbäume und Forstpflanzenzüchtung. [Different phases in the development of forest trees and their relation to forest tree breeding.]** *Silvae Genet.* 6 (5), 1957 (136-42). 23 refs. [G.g.e.f.]

Discusses the importance in tree breeding of distinguishing between juvenile and adult forms of the tree. Since trees do not flower during the juvenile phase, it is necessary to use old scions when grafting for seed production. On the other hand, since cuttings in the juvenile phase root more easily, they should be used for the vegetative propagation of good phenotypes and for clonal tests. In broadleaved trees, as well as in several coniferous species, juvenile and older forms occur on the same individual, and it is therefore possible to produce vegetative generations of juvenile and adult forms from the same clone for different purposes or for

comparative trials. It is necessary to guard against the possible influence of a juvenile rootstock upon an older scion and a consequent reversion of the older scion to a juvenile stage. *From author's summary.*

#### 181.8. Phenology

See also Nos. 1352-3, 1363, 1467-8, 2047-8, 2265.

1509. AHLGREN, C. E. **Phenological observations of nineteen native tree species in northeastern Minnesota.** *Ecology* 38 (4), 1957 (622-8). 3 refs.

The phenological responses studied over a period of 5 years were bud swelling, flushing, flowering, pollination, seed-fall, leaf colour change, leaf-fall, and stem expansion. It was found that *Pyrus americana*, *Populus tremuloides*, *Betula lutea* and *B. papyrifera* begin spring activity in the first warm period when minimum temperatures may still be below freezing. *Picea glauca*, *P. mariana* and *Pinus resinosa* begin activity when minimum temperatures are  $\geq 30^\circ\text{F.}$ , *Ulmus americana* and *Acer rubrum* when maximum temperatures have reached  $\geq 60^\circ$ , and *Fraxinus nigra*, *F. pennsylvanica*, *Abies balsamea*, and *Pinus strobus* when they have reached  $\geq 70^\circ$ . Initial spring activity in *Tilia americana*, *Quercus macrocarpa*, *Populus grandidentata* and *Acer saccharum* seems unrelated to any specific temperatures. In the species studied, no obvious correlation appears between current temperature levels and the beginning of either flowering or leafing. Stem expansion frequently fluctuated with abrupt changes in temperature and rainfall, but apart from these temporary fluctuations a typical growth curve was obtained for all species. In most species, the onset of cambial activity occurred after maximum temperatures were  $\geq 70^\circ$  and minimum temperatures above freezing. Dates of some phenological responses may vary as much as one month from one year to the next.

1510. JOACHIM, H. F. **Phänologische Beobachtungen an der Gattung Populus. [Phenological observations on Poplars.]** *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (*Beitr. Pappelforsch.* No. 2), 1957 (75-97 + 2 tabs.). 33 refs. [G.g.]

The paper is based, in the main, on 5 years' observation in the Berlin-Eberswalde area and presents, for ca. 20 species or varieties, comparative dates of flushing and leaf-fall, with observations on coloration, development etc. on various sites. A classification according to relative times of flushing and leaf-fall is presented, which generally accords well with the observations of Peace and Houtzagers [see *F.A.* 9 No. 186; 14 No. 1026]. Differences are discussed. The influence of site and microclimate, of provenance and heredity, and the use of phenology in identification are dealt with.

#### 182. Synecology, Plant Sociology: General, Principles and Methods

1511. BECKING, R. W. **The Zürich-Montpellier school of phytosociology.** *Bot. Rev.* 23 (7), 1957 (411-88). 12 pp. of refs.

A review, chiefly of European and American literature, dealing briefly with the general history of



European phytosociology and the physiognomic-ecological Uppsala and Russian schools, as background to a detailed account of the Zürich-Montpellier school under the heads: general vegetation concepts; analytic phase, synthetic phase; nomenclature; historical trend in diagnostic species evaluation; IBM codification as a substitute for synthesis tables; statistics in vegetation analysis, random sampling and homogeneity; and some considerations and criticisms of the school.

### 182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also No. 1539.

1512. GIGOV, A. Dosadašnji nalazi o post-glacialnoj istoriji šuma Srbije. [The post-glacial history of Serbian forests.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 7 (3), 1956. pp. 26. 58 refs. [Serb.g.]

Reviews literature, mainly Slav, on pollen-analysis studies for different species and areas in Serbia.

1513. KAC, N. JA. O granicah torfjano-bolotnyh počv, o rastitel'nyh arealah i ih formirovanii v svjazi s klimatom i geologičeskoj istoriej. [The [southern] limits of peat-bog soils and the formation of the natural ranges of plants in relation to climate and geological history.] *Počvoved.* 1957 (5), (12-21). 43 refs. [Russ.e.] A.P.B.

Considers, from a review of the literature, the development of peat bogs in Eastern Europe, and the limits of distribution of some plants (especially *Picea abies*) in relation to climatic conditions after the Ice Age.

1514. GOLUBEVA, L. V. K voprosu o značenii opredelenija pylcy vidov roda *Betula* L. dlja celej stratigrafii četvertičnyh otloženij. [The significance of the pollen of *Betula* spp. for the stratigraphy of Quaternary deposits.] *Dokl. Akad. Nauk SSSR* 114 (3), 1957 (645-7). 3 refs. [Russ.] A.P.B.

In Quaternary deposits round the river Ob in the W. Siberian plain the author identified *B. pubescens*, *B. verrucosa*, *B. nana* and *B. humilis*. The climatic significance of these data is discussed.

1515. BOUGHEY, A. S. The origin of the African flora: an inaugural lecture given in the University College of Rhodesia and Nyasaland. Oxford University Press, London, 1957. pp. 48. 42 refs.

1516. DICK-PEDDIE, W. A. Presettlement forest types in Iowa. *Abstr. of thesis, in Iowa St. Coll. J. Sci.* 31 (3), 1956 (391-2). O.R.E.

Concludes from studies of original survey records that the forests of the S.E., where the forest prairie ecotone was stabilized, are much older than those of the N.E. or W. where invasion, particularly by *Quercus macrocarpa* and *Ulmus americana*, was proceeding rapidly; and that the climax vegetation is an Oak/Hickory type, prairie being subclimax and Oak/Maple/Linden post-climax.

### 182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 1516, 1539, 1550, 1552-3, 2093-4.

1517. GIMINGHAM, C. H., and BOGGIE, R. Zonation of Scots Pine and Norway Spruce in the N. Trøndelag district of Norway. *Scot. For.* 11 (4), 1957 (155-66). 7 refs.

A general description is given of topography, soil and vegetation in the neighbourhood of Lake Vera, where both *Picea abies* and *Pinus sylvestris* are native. Peat-filled depressions lie between elevated knolls or more extensive raised areas showing well developed iron podzols. Corresponding with this topography, a regular zonation of 3 community types is found. Spruce forest occupies the knolls and raised ground; *Molinia-Trichophorum* mire fills the depressions; and between is a transition region dominated by Pine, which also occurs on hummocks or islands in the mires. The Pine fringe is characteristic of the fen margins where podzol profiles dip below peat which has encroached in the past. In floristic composition it is intermediate between the adjacent communities and it thus represents an ecotone between Spruce forest and mire, in a soil-vegetation catena based upon the knoll and hollow topography. The zonation is characterized by sharp boundaries. Pine establishes no seedlings under Spruce, and Spruce seedlings in the Pine fringe make poor growth and quickly die back. The zone occupied by Pine corresponds closely with a belt of *Vaccinium uliginosum* dominance in the field stratum. The development of moss hummocks in the fen is briefly traced, the entry of Pine seedlings occurring when the community reaches a stage equivalent to the Pine fringe, i.e. with lichens, *Calluna vulgaris* and *V. uliginosum*. The restriction of Pine to the margins and islands of the peat mires is discussed. From authors' summary.

1518. HUIKARI, O. Primäärinen soistumisen osuudesta Suomen soiden synnyssa. [The part played by primary bog formation in the origin of Finnish bogs.] *Commun. Inst. for. Fenn.* 46 (6), 1956 (1957). pp. 80 + chart. 67 refs. [Finn.g.]

A study was made of ca. 30 bogs in different parts of Finland, and the experimental data are set out and discussed in detail, with an 8-page German summary. It is concluded that 40% of the bogs investigated originated in direct succession to bog, and 50% in bog formation on forest soils.

1519. HALL, I. G. The ecology of disused pit heaps in England. *J. Ecol.* 45 (3), 1957 (689-720) + 2 tbs., 1 plate. 4 refs.

Based on a preliminary ecological investigation, which formed part of a survey of the problems of afforesting pit waste, made in 1952 in Somerset, the Forest of Dean, the Black Country, N. and S. Staffordshire, Durham, Northumberland and W. Cumberland.

1520. NOMOTO, N. Analysis of the succession process on the Beech/Oak forest. *Japanese Journal of Ecology* 6 (3), 1956 (102-7). [Jap.e.] From *abstr. in Biol. Abstr.* 31 (9), 1957 No. 27027.

A study was made of the succession of Beech to

Oak in 3 stands near Tokyo, and it is concluded that Oak forest would normally give way to Beech in process of time. On the basis of photosynthetic activity of the two species and relative illumination within the stand, the height-growth curves of young Oak and Beech are plotted for various stand densities.

1521. McCORMICK, J., and BUELL, M. F. **Natural vegetation of a plowed field in the New Jersey Pine barrens.** *Bot. Gaz.* 118 (4), 1957 (261-4). 9 refs. O.B.D.

Vegetation on a formerly cultivated field, surveyed 5 and 13 months after abandonment, showed a very diverse flora, but the indications were that if the area were allowed to revert to forest, a floristically impoverished community of very different composition from the surrounding forest could be expected. Seedlings of only one woody species, *Quercus velutina*, were discovered. The other woody species found were coppice shoots from undestroyed roots.

1522. DIX, R. L. **Sugar Maple in forest succession at Washington D.C.** *Ecology* 38 (4), 1957 (663-5). 10 refs.

1523. WOODS, F. W., and SHANKS, R. E. **Replacement of Chestnut in the Great Smoky Mountains of Tennessee and N. Carolina.** *J. For.* 55 (11), 1957 (847).

Studies in the S. Appalachian forests, where the Chestnut in the Oak/Chestnut association has been killed by blight, show that it is being replaced by various species of Oak, particularly *Q. prinus* and *Q. rubra*. It is believed that an Oak association complex will be formed eventually. [Cf. *F.A.* 16 No. 3914.]

1524. PLOCHMANN, R. **Gegensatz in der Wiederbewaldung von Brandflächen NW-Albertas und der pazifischen Küste. [Differences in the natural succession to forest of burned areas in N.W. Alberta and on the Pacific Coast.]** *Mitt. StForstverw. Bayerns* No. 29, 1957 (135-41). [G.]

In N.W. Alberta, where the climax forest is *Picea glauca* with *Abies balsamea*, *Populus balsamifera*, *P. tremuloides* and *Betula papyrifera*, the succession generally begins with *P. tremuloides* followed by other light-demanders, with *P. glauca* coming in at the pole stage. In Vancouver Island, the main species, Douglas Fir and *Pinus monticola*, regenerate only after a fire, and the secondary species arrive later. [Cf. *F.A.* 18 No. 2629.]

1525. BOUGHEY, A. S. **Ecological studies of tropical coast-lines. I. The Gold Coast, West Africa.** *J. Ecol.* 45 (3), 1957 (665-87 + 8 plates). 39 refs.

Includes a brief characterization of vegetation zones, two of which are evergreen shrub and Mangrove. Successional relationships are discussed and a comparison is made with other tropical coast-lines.

1526. PURI, G. S., and DABRAL, S. N. **Succession of ground flora species in the forest plantations of New Forest, Dehra Dun.** *Indian For.* 83 (9), 1957 (551-4 + 6 dgms.).

[Cf. *F.A.* 16 No. 1541.] Describes the spread and development of some common species over a period of a few years on quadrats laid out in the forest.

#### 182.4. Layer Communities

See also Nos. 1526, 1554.

1527. HOLSTENER-JØRGENSEN, H. **Floraundersøgelse i Mølleskoven. 3. beretning. [The flora of Mølleskoven. Third report.]** *Forstl. Forsøgsv. Danm.* 22 (2), 1956 (247-73). 7 refs. [Dan.e.]

Compares the ground flora in 1954 with that in 1918-37. During the period since 1918, there have been heavy thinnings, and the areas under Beech and other hardwoods have decreased while those under Pine, Spruce and other conifers have increased.

1528. HOSOKAWA, T., and ODANI, N. **The daily compensation period and vertical ranges of epiphytes in a Beech forest.** *J. Ecol.* 45 (3), 1957 (901-15 + 1 set of graphs). 25 refs.

Presents results of laboratory experiments and field studies with 13 corticolous species on a single tree at Mt. Hiko, Urahiko, Japan.

1529. SAWARAGI, S. **The epiphytic bryophyte community of *Shiia cuspidata* Makino.** *Japanese Journal of Ecology* 6 (4), 1957 (159-62). [Jap.e.] From *abstr. in Biol. Abstr.* 31 (11), 1957 (No. 33721).

On the trunks of 4 sample trees were found 41 species of liverworts and 12 species of mosses. Vertical distribution is described; the greatest value of frequency was found at the crown base.

1530. SHARP, A. J. **Vascular epiphytes in the Great Smoky Mountains.** *Ecology* 38 (4), 1957 (654-5). 6 refs.

Includes descriptions of several tree species, especially *Betula lutea* (generally self-epiphytic) and *Picea rubens*, growing as epiphytes on other trees.

#### 182.5. Synecological Measurements and Methods

See No. 2125.

#### 182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

See No. 1526.

#### 187. Vegetation Types

See also Nos. 1289, 1310, 1316, 1464, 1516-8, 1524-5, 2136-7, 2229, 2611.

1531. RÜHL, A. **Waldgeographische Kriterien bei der Abgrenzung naturräumlicher Einheiten. [The use of criteria from forest geography in the delimitation of 'natural' geographical units.]** *Allg. Forst- u. Jagdztg.* 128 (10/11), 1957 (208-12). 33 refs. [G.g.e.]

Discusses the literature and maps on the division of Germany into natural geographical or growth regions, which in the author's view rely rather too much on topography and geology, and suggests that more account be taken of plant-sociological and plant-geographical factors, e.g. natural forest types, indicator plants, giving local examples.

1532. JONSSON, B. **Ljungstudier på tallmo i Södertörn. [Studies on *Calluna vulgaris* on Pine heath in Södertörn.]** *Svenska SkogsvFören. Tidskr.* 55 (4), 1957 (413-51 + 1 dgm.) 25 refs. [Sw.sw.g.]

In the area studied, the distribution of *Calluna* was dependent primarily on light; it was found in



the open and within the stand where there were openings in the crown canopy. However, once it was present, nutrients and moisture were as important as light. It yielded a thick layer of litter, with only a small amount of nutrients per unit of weight, and the rate of decomposition depended on temperature and moisture relations. Moss flourished among the *Calluna*, which reduced the direct evaporation from the soil and had a favourable effect on the moisture in the upper layers. Presumably because of this, regeneration of the Pine among it was good. The growth form of the *Calluna* depended on light, plants in the open growing normally and those in closed stands being drawn up. The occurrence of *Epilobium angustifolium*, *Luzula pilosa* and *Deschampsia flexuosa* in the area are discussed.

1533. CUCCHI, C. Aspetti forestali dell'Alta Val d'Aveto. [Forest aspects of the Alta Val d'Aveto.] *Ital. for. mont.* 12 (4), 1957 (167-77). 15 refs. [It.it.f.]

Describes the forest and other vegetation types of the upper part of the catchment of the Trebbia, a tributary of the Po, rising in the Apennines.

1534. Sección de ecología, tipos de montes y suelos forestales. [Section for ecology, forest types and forest soils.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (27-36 + 2 plates). [Span.]

Notes on some *Pinus nigra* var. *calabrica* associations in the province of Cuenca are included in the report on the work of this section.

1535. MAJER, A. Erdőtípus-csoportjaink és erdőgazdasági hasznosításuk. [Forest types of Hungary and their use in forestry.] *Erdész. Kutatás., Budapest* 1956 (4), (3-32). 73 refs. [Hu.russ.e.g.]

[Cf. F.A. 17 No. 1126.] Tabulates the site factors, the 7 forest vegetation zones (subdivided for podzols and non-podzols and grouped into 7 water-management classes), the trees, shrubs and grasses, with their significance as indicator species, and discusses with 14 examples the application of the classification in practical forestry, appending a combined list of the species with their scientific and Hungarian names. The zones distinguished are: (1) Spruce (*Abieto-piceetum*) on podzols. (2) Beech (*Fagetum sylvaticae* and *Acereto-Fraxinetum*). (3) Beech/Hornbeam/Oak (*Fageto-Ornetum*, *Tilio-Fraxinetum*, and *Querceto-Carpinetum*). (4) Oaks (2 associations on podzols, 4 on non-podzols and 3 on both). (5) Birch/Poplar; Alder/Willow (*Betula-Callunetum*; *Junipereto-Populetum* and 7 others involving Poplar, Alder, Willow, Ash and Birch). (6) Scots/Austrian Pine podzolic and non-podzolic (*Dicrano-Pinetum*). (7) Artificial, mainly Robinia, forest.

1536. KÁRPÁTI, I., and KÁRPÁTI, I. [V.] A *Fraxinus oxycarpa* Willd. és *Fr. excelsior* L. ökológiai elkülönítése. [Coenological differentiation of *F. oxycarpa* and *F. excelsior*.] *Erdész. Kutatás., Budapest* 1957 (1/2), (65-81). 52 refs. [Hu.russ.e.g.]

A detailed study shows that *F. oxycarpa* is the characteristic tree species of the *Saliceto-Populetum*, the *Querceto-Ulmetum hungaricum* and the *Fraxinetum*

*Alnetum hungaricum*. In the *Tilio-Fraxinetum* and the *Acereto-Fraxinetum* of the rocky and ravine mountain forests of medium altitude, *F. excelsior* is dominant.

1537. HORVAT, I. Die Tannenwälder Kroatiens im pflanzensoziologischen und forstlichen Zusammenhang. [Plant sociology and forestry of the Croatian Silver Fir forests.] *Schweiz. Z. Forstw.* 108 (10/11), 1957 (570-96). 17 refs. [G.g.f.]

A lecture, chiefly based on published work by the author and others, on the 3 main types (*Fagetum-croaticum-Abietetum*, *Blechno-Abietetum* and *Calamagrosteto-Abietetum*), their vegetation, climate, soils, silvicultural peculiarities, regeneration, growth patterns, wood properties of the tree species etc. [Cf. F.A. 14 No. 1063.]

1538. OBERLI, H. Forstbotanische Notizen aus Jugoslawien. [Notes on forest botany from Yugoslavia.] *Schweiz. Z. Forstw.* 108 (10/11), 1957 (597-602). [G.]

Notes on a study tour through parts of Slovenia, Croatia and Bosnia, including plant-sociological classifications based on Horvat's classification.

1539. GIGOV, A. O bukovim šumama sa orahom na području Grdeličke Klisure. [Beech forests containing *Juglans regia* in the territory of Grdelička Klisura.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 6 (6), 1955. pp. 11. 18 refs. [Serb.g.g.]

From a review of the literature it is concluded that *J. regia* is native to the flora of the Balkan peninsula, exhibiting a characteristic difference in its post-glacial forest successions from those of N. and Central Europe.

1540. TATEWAKI, M., and TSUJII, T. [The iconography of the vegetation of the natural forest in Japan. I. The central Sanyo district.] *Res. Bull. Exp. For. Hokkaido Univ.* 18 (1), 1956 (1-54 + 24 photos). [Jap.e.e.]

Describes, with photographs and stand and association tables, the vegetation on transects in different forest types.

1541. TATEWAKI, M., and MISUMI, T. [Iconography of the vegetation of the natural forest in Japan. II. Island of Yakushima. III. Southern Kyushu.] *Res. Bull. Exp. For. Hokkaido Univ.* 18 (2), 1957 (53-207 + 70 photos). 73 refs. [Jap.e.e.]

Continued on the same lines as Part I.

1542. TANIGUTI, M. Deciduous forest in Miura peninsula. *Japanese Journal of Ecology* 6 (3), 1956 (96-8). [Jap.e.] From *abstr.* in *Biol. Abstr.* 31 (9), 1957 (No. 27047).

The forest, classified as *Quercus serrata*/Pleio-blastus *chino* association, is of coppice origin, following the destruction of the climax forests of *Shiia sieboldii* and *Machilus thunbergii*.

1543. YAMANAKA, T. On the *Chamaecyparis obtusa* forest in Shikoku, Southern Japan. *Japanese Journal of Ecology* 6 (4), 1957 (149-52). [Jap.e.] From *abstr.* in *Biol. Abstr.* 31 (11), 1957 (No. 33729).

Describes the *C. obtusa*/Rhododendron *metternichii* association.

1544. **Tropical vegetation: list of references, India, Burma, and Ceylon 1948-1954.** U.N.E.S.C.O. South Asia Science Co-operation Office, New Delhi. 1956. pp. 12.

A selection from the UNESCO Scientific Bibliography of South Asia, made for the Symposium on Tropical Vegetation, Ceylon, 1956.

1545. PURI, G. S. **The relict vegetation of Sheo Bari, Sohan Valley on the Hoshiarpur Siwaliks.** *Indian For.* 83 (12), 1957 (718-23).

In contrast to the scrub vegetation prevailing in the rest of the valley, the Sheo Bari forest has been preserved in a virgin state owing to a belief that anyone who grazes his cattle, or lops or fells trees for any purpose in it, will be punished by the Lord Siva. The vegetation is mesophytic, with *Putranjiva roxburghii*, *Albizia lebbek*, *Litsea chinensis* etc. in the overstorey. It is suggested that mesophytic vegetation could exist in a stable equilibrium in the valley as a whole, if human interference were excluded.

1546. KERMODE, C. W., *et al.* **The forest types of Burma.** *Burmese For.* 7 (1), 1957 (6-38).

Gives a new classification, on an ecological basis, adapted from that put forward by Champion.

1547. KINGDON-WARD, F. **The great forest belt of North Burma.** *Proc. Linn. Soc., Lond.* 168 (1/2), 1957 (87-96). 10 refs. O.B.D.

Ecological and botanical observations.

1548. EXELL, A. W. **La végétation de l'Afrique tropicale australe. Données sur la superposition de lignes de distribution nord-sud sur un système fondamental est-ouest. [The vegetation of southern tropical Africa. Data relating to the superimposing of N.-S. distribution lines upon a fundamental E.-W. system.]** *Repr. from Bull. Soc. Bot. Belg.* 89, 1957 (101-6). [F.]

Presents data upon which are based lines drawn from N. to S. defining the distribution of vegetation. These lines can be superimposed upon already accepted E.-W. lines, based on rainfall.

1549. MONTEIRO, R. F. ROMERO. **Aspectos da exploração florestal do distrito de Moxico. [Studies in the forests of the district of Moxico [Angola].]** *Garcia de Orta, Lisboa* 5 (1), 1957 (129-46). 5 refs. [Port.f.e.]

The *Berlinia*/*Brachystegia*/*Combretum* community that occupies a large part of this region is grouped by the author under the Hiemisilva of Brockmann-Jerosch and Rübel. Information is given on 17 important species of this community. Notes are also presented on the gallery forests and the savannas, and some figures relative to the timber industry of the region are included.

1550. CLAUSEN, J. J. **A phytosociological ordination of the conifer swamps of Wisconsin.** *Ecology* 38 (4), 1957 (638-46). 16 refs.

As a result of a study of 106 conifer swamps, stands were ordered along a gradient based on similarity of herb composition and the gradient correlated with vegetational and environmental

factors. The extremes of the gradient are represented by the *Larix laricina*/*Picea mariana* type and the *Thuja occidentalis*/*Abies balsamea* type, linked by infrequent intermediate types.

1551. MAYCOCK, P. F. **The phytosociology of boreal conifer-hardwood forests of the Great Lakes region.** *Abstr. of thesis, in Dissert. Abstr.* 17 (10), 1957 (2132). O.R.S.

Discusses the results of studies of species distribution and ecological tolerances in 110 upland stands.

1552. BUELL, M. F., and NIERING, W. A. **Fir-Spruce-Birch forest in Northern Minnesota.** *Ecology* 38 (4), 1957 (602-10). 24 refs.

In 5 relatively undisturbed upland coniferous forest stands, Balsam Fir [*Abies balsamea*], White Spruce [*Picea glauca*] and Paper Birch [*Betula papyrifera*] were consistently dominant. All stands were on areas formerly occupied by Pine [*Pinus banksiana* and *P. resinosa*]; in most of them the Pine had been burned, cut, or windthrown, but in one had been replaced by natural succession. The Fir/Spruce/Birch community gives every evidence of maintaining itself. Fir reproduction is the most successful and will continue to maintain the dominance of Fir. Poor White Spruce reproduction suggests that this species will continue to play a role secondary to Fir. Paper Birch, wherever it gets established, will persist by sprouting. *From authors' summary.*

1553. McMINN, R. G. **Soils and forest growth in the Douglas Fir region on Vancouver Island.** *Abstr. in Agricultural Institute Review, Ottawa* 12 (3), 1957 (44). O.R.E.

In a study of a section of the Nanaimo River Valley, 8-12 miles from the E. coast, where rainfall was sufficient to cause considerable leaching and acidification of soil profiles, but summer rainfall was slight, soil moisture regimes were found to be a major factor differentiating sites. Within the various climatic types of the study area, topography was the main influence in soil profile development. A catenary sequence of forest associations was referable to the soil catenas found on side hills. [Cf. *F.A.* 13 No. 3718.]

1554. SECOR, J. B. **Soil characteristics in relation to certain forest types in the northern Rockies.** *Abstr. of thesis, in Dissert. Abstr.* 17 (4), 1957 (735-6). O.R.S.

Presents results of an investigation of the relationships between the herb and shrub layers and soil properties in 4 habitat types of the *Picea engelmannii*/*Abies lasiocarpa* zone in the mountains of N. Idaho.

1555. ALLEN, P. H. **The rain forests of Golfo Dulce [Costa Rica].** University of Florida Press, Gainesville, Fla. 1956. pp. xi + 417. 65 refs. Price \$8.50 (£3. 8s.).

A detailed account with sections on: ecology (climatic, edaphic and transitional formations); conspicuous or distinctive species; lists of common and scientific names and of economic, medicinal and poisonous spp.; and an alphabetical list of the principal species with notes on silvicultural properties, uses etc. (250 pp.).



1556. HOLDRIDGE, L. R., and BUDOWSKI, G. **Report of an ecological survey of the Republic of Panama.** *Carib. For.* 17 (3/4), 1957 (92–110). 14 refs.

Data on site factors, species, exploitation opportunities, and a map of the following forest zones:

tropical (0–700 m., 76.3% of total area), dry, dry-transition, moist, and moist-transition; subtropical (700–1500 m., 18.6%), moist and wet; lower montane (1500–2600 m., 4.8%) wet; montane (2600 m., 0.3%), wet.

## 2. SILVICULTURE

See also Nos. 1426–7, 1456, 1458, 1537, 2149, 2171, 2611.

1557. MACDONALD, J. A. B. [Review of J. Köstler: 'Silviculture' (translated by M. L. Anderson).] *Forestry* 30 (2), 1957 (195–8). [Cf. F.A. 18 No. 273.]

1558. **How should we grow conifers?** (Forestry conference at Dartington Hall.) *Quart. J. For.* 51 (4), 1957 (322–31).

Report of a symposium, with summaries of discussions on: The place of economics in forestry; Should we grow trees principally for timber or for other purposes?; The importance of the size of the tree, annual ring thickness and knots; Clear felling versus other silvicultural systems; Thinning methods.

1559. GRENNING, V. **Production of quality wood in coniferous plantations in Queensland.** Queensland Forestry Department. 1957. pp. 14. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses measures (e.g. seed selection, pruning, thinning) to ensure maximum growth rate and high-quality wood from *Araucaria cunninghamii*, *Agathis* spp. and exotic Pines.

1560. EBELING, F. Den nuvarande Norrlandslinjen inom svenskt skogsbruk—tilfälligt mode-riktning eller välgrundad nydaning. [The present policy for Norrland in Swedish forestry—a passing fashion or a well-founded re-organization?] *K. Skogs- o. Lantbr.Akad. Tidskr.*, Stockh. 96 (4), 1957 (264–85). [Sw.e.] E.M.B.

Discusses the problems characteristic of N. Sweden—competition, the effect of altitude and latitude on growth, and the large existing areas of poor forest. Describes briefly methods of treating the main site types—Pine heath, moist peaty soils, and wet sites—to reduce competition and ensure better tree growth.

1561. HOLMSGAARD, E. Lidt om løvtrædyrkning. [Notes on growing hardwoods.] *Dansk Skovforen. Tidsskr.* 42 (3), 1957 (147–68). 41 refs. [Dan.]

The species discussed include Beech, Hornbeam, Oak (including American Red Oak), Ash, Sycamore, Maple, Alder and Birch, with recommendations for regeneration, spacing, tending etc. Comparative revenue figures for districts with different site qualities suggest that hardwoods are economically desirable only on Beech site quality classes of 2.2 and over. [Cf. F.A. 19 No. 2183.]

1562. MOWAT, W. **Some observations on growing Sycamore [*Acer pseudoplatanus*].** *Scot. For.* 11 (4), 1957 (177).

Notes on silvicultural characters, nursery practice, planting methods etc. [Cf. F.A. 19 No. 2184.]

1563. GRANDJEAN, A. J., and LAAR, A. VAN. De eikenteelt in de Spessart. [Oak cultivation in the Spessart forest [near Aschaffenburg].] *Ned. Boschb.-Tijdschr.* 29 (9), 1957 (207–14). [Du.du.g.]

Discusses the establishment, tending, and yields, of Oak stands intended for veneer, grown in mixtures with Beech, Lime and Larch.

1564. GUPTA, M. **Teak in Uttar Pradesh.** *Bull. U.P. For. Dep.* No. 29, 1957. pp. 22 + 1 map. 17 refs.

Silvicultural characters and techniques are described in detail, and desirable lines of research indicated.

1565. WIROATMODJO, R. SUNJOTO. Memperbesar produksi kayu djati di Djawa. [Increasing Teak production in Java.] *Rimba Indonesia* 4 (9/12), 1955 (378–409). 12 refs. [Jav.jav.e.]

Recommends: planting of deforested areas; thinnings based on canopy density, not on number of stems; road-building to allow of thinning in areas at present inaccessible; selection felling in the fifth decade to accelerate increment; economical cross-cutting; use of appropriate silvicultural systems in areas unsuitable for clear felling; use of the financial rotation; and intensive management to improve soil conditions and to allow shorter rotations. A 50-year rotation is desirable for average site classes of  $\geq 3$ , and on site class 3.5 gives a m.a.i. of 0.8 cu.m./ha, more than an 80-year rotation. *From author's summary.*

## 22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

### 221. High Forest Systems

See also Nos. 1342, 1577–8, 1584, 1746, 1755, 1853, 1855, 2145, 2188.

1566. BUDOWSKI, G. **Regeneration systems in tropical American lowlands.** *Carib. For.* 17 (3/4), 1957 (76–91). 83 refs. [Span.E.span.e.]

Considers the merits of the clear-felling, enrichment-by-strips and shelterwood systems, quoting extensively from experience in Burma, India, Malaya, Africa, tropical America etc. Methods and species (both indigenous and exotic) for use in tropical America are recommended.

1567. ATTENBERGER, J. Zur Problematik der waldbaulichen Behandlung von natürlichen Beständen, dargestellt an Beispielen aus dem Bayerischen Wald. [The silvicultural treatment of natural stands, illustrated by examples from the Bayerische

Wald.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (125-34). [G.]

An investigation of the effect on the natural regeneration of the 3 main species, Beech, Spruce and Silver Fir, of the silvicultural methods practised since the early 19th century, when these mixed mountain forests were first exploited. While ca. 45% of the stands treated by unregulated selection and shelterwood strip fellings up to the 1880's contain Silver Fir, the species has practically disappeared from younger stands regenerated by group selection, the strip-and-group, and the selection system proper since that date. Beech, often poor, is inclined to suppress Spruce. Silvicultural measures such as early tending of mixtures to favour Spruce, and fencing to allow Silver Fir to come up, are discussed with special reference to the treatment of the few remaining natural stands.

1568. MOULOPOULOS, CH. *Physikē anagennēsis tōn elatosystadōn en Helladi kai idia en tō dasei Pertouliou.* [Natural regeneration of *Abies cephalonica* and *A. c. × A. alba* in Greece and particularly in Pertouli forest.] *Epistēmōnikē Epetēris Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* No. 3, 1955/1956 (177-277). 43 refs. [Gk.f.f.]

In a long-term regeneration study (1939-55), replicated trials were made of elliptical openings (180), smaller circles (36) and strips of various shapes and dimensions, both clear felled and gradually opened, on 4 aspects, 3 site types and slopes of 10, 30 and 60%. It is concluded that best conditions for Fir regeneration obtain in elliptical openings, the minor axes of which, running N.-S., equal the length of shadow from the adjoining stand at noon on the 21st June (N. lat. 39° 30') and the major axis is  $\geq 3$  times as long. Extensions should be made to the S. by clear felling or opening the canopy to a width estimated in the same way as that of the short axes mentioned above. Where there is frost danger, or too much sun, encouraging rapid grass-growth, a gradual opening of the canopy is better. Single-tree selection, while particularly suitable for the best and moister sites, is not superior to the staggered canopy created by elliptical openings. Edge and strip fellings can be used only on the N., N.E., and N.W. aspects on moderate slopes and in echelon. A 50-100% cover of bracken assures the establishment of seedlings by lateral dispersal of seed. Generally in Greece, fellings should proceed from the N., N.E., and N.W. aspects to the S., S.W., and S.E., and southern edges should not be opened except perhaps on steep N. slopes where shade for seedlings is assured. Silvicultural prescriptions summarized include a reference to a table showing the dimensions of elliptical openings recommended for various orientations and slopes, and a formula is given for the number of openings to be made in the stand.

1569. LITTLE, S., and MOHR, J. J. *Growth and mortality of residual Loblolly Pines after a seed-tree cutting.* *For. Res. Note Ntheast. For. Exp. Sta.* No. 75, 1957. pp. 4. 9 refs.

Ten seed trees per acre were left in a stand on the E. coast of Maryland. Between 1953 and 1957

mortality, mainly from windthrow and wind breakage, averaged 35%, causing a reduction in b.a. and volume despite rapid diameter increment of the survivors. Different seedbed treatments (burning, bulldozing, ploughing etc.) appeared to have little effect on seed-tree mortality. The authors recommend that seed trees of Loblolly be harvested as soon as adequate regeneration is established. [Cf. *F.A.* 19 No. 1581.]

1570. BLYTH, A. W. *The effect of partial cutting in even-aged Lodgepole Pine stands.* *Tech. Note For. Br. Can.* No. 61, 1957. pp. 14. 9 refs.

In order to assess the results of partial cutting in Lodgepole Pine, a study was made of cut-over stands in the Edson district of Alberta. Forty-five 0.4-acre plots were established in stands cut 12 to 30 years ago, and analysed to determine the effect of cutting on diameter growth, volume growth, and regeneration. The main results obtained are as follows: (1) Partial cutting causes no perceptible increase in the diameter increment of the residual trees. (2) The net volume growth in residual stands is poor, and indications are that it is less than would occur if the stands were allowed to grow undisturbed. (3) Pine regeneration is very poor and totally inadequate to reproduce the stand. In certain stands after cutting there is a definite change in composition towards a hardwood forest, as a result of Poplar and Birch regeneration. (4) Continued partial cutting results in a drastic lowering of Pine growing stock and ultimately in the almost complete elimination of this species from the stands. *From author's summary.*

1571. ROWAN, A. A. *The Kyloe selection stands.* *Quart. J. For.* 51 (4), 1957 (311-21). 3 refs.

An area of old Scots Pine at Kyloe, Northumberland, was underplanted about 1910 with a variety of species, principally *Tsuga heterophylla*. This has developed into a series of uneven-aged stands as a result of natural regeneration. A sample area of 11.7 acres was enumerated by the Check Method [méthode du contrôle], and the volume calculated from Anderson's conventional volume table [see *F.A.* 14 No. 3642]. A series of Pressler borings gave the time of passage of the various stand elements. From these the stem-number distribution of 5 years previously was worked out, and the increment found by comparison with the present inventory. The future development of the stand is considered, and an estimate is made of the probable ideal stem-number distribution. Treatment is suggested to maintain and improve the selection structure of the stand, and to raise productivity. *Author's summary.*

1572. BERNARD, M., and ANDRÉ, Y. *Recherches sur les lois de croissance du chêne et du hêtre dans les peuplements de la moyenne vallée de la Saône. Type de chênaie traitée en futaie par bouquets.* [Studies of the laws of growth of Oak and Beech in the stands of the middle Saône valley. Oakwood managed on the group selection system.] *Rev. for. franç.* 9 (8/9), 1957 (662-76). [F.]

The forests in question are the result of conversion of coppice-with-standards to high forest, and the



authors expound the group-selection system which they have developed in order to assist in their evolution towards true selection forest. The ideal density aimed at is based on the formula  $S = K\sqrt{v}$  where  $K$  is a coefficient varying with species and treatment, and  $S$  is the area of crown projection of a tree of volume  $v$ .

## 222. Coppice, Pollarding and Lopping Systems

See Nos. 1573, 1779.

## 226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 1572, 1754–8, 2172.

1573. COINTAT, M.; LEMPS, F. DE. La régénération du chêne dans l'est de la France. [The regeneration of Oak in eastern France.] *Bull. Soc. for. Franche-Comté* 28 (8), 1957 (435–45). [F.]

The first author develops a formula for determining a 'regeneration threshold', i.e. a minimum stocking that will ensure natural regeneration and permit immediate conversion of Oak coppice-withstandards to high forest. The suggested threshold for Haute-Marne is a stand volume (of standards) of 80 cu.m./ha. with a mean tree of 1.3 cu.m. The second author objects to the threshold concept and urges that each stand should be judged on its own merits.

## 228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 1348, 1751, 2132, 2143–5, 2147, 2547, 2550–1, 2605.

1574. ERTELD, W., and KRÄUTER, G. Untersuchungen über die Erkennbarkeit guter und schlechter Zuwachsträger bei der Kiefer. [Recognition of the trees of better increment in Scots Pine.] *Arch. Forstw.* 6 (5/6), 1957 (361–420). 27 refs. [G.g.russ.e.]

The material of a previous study [cf. *F.A.* 18 No. 775] is here increased to 716 stems from 12 stands, 90 years old, making more accurate measurements of individual stems for the clarification of correlations between external characters *inter se* and between these and the course of growth. Twelve height c.a.i. curves were distinguished, based on the time elapsing to peak, the peak's magnitude, and differences in the subsequent decline. The external characters used for estimating potential increment were: (a) internode length in the lowest 3 m. of bole; (b) crown length/breadth; (c) branch (stub) angle and (d) branch diameter (both for the middle to lower bole); (e) tree form factor. Characters found unsatisfactory and abandoned were: crown persistence (*Kronenbeharrungsvermögen*), the capacity to maintain shape under lateral competition with stems of equal or superior crown class; bark thickness; and cone-bearing. The highest correlations ( $r = 0.3\text{--}0.5$ ) were found between (a) and (d), (d) and (c), (b) and (d), and (b) and (c), in descending order. The lowest ( $r = 0.15\text{--}0.25$ ) were those with (e). Allotting up to 10 marks each for low (a), (b) and (d) (slow initial growth, long

narrow crowns and fine lower branches) and high (c) (flat lower branching) and (e) (form factor), the %'s of stems falling into classes of 5-mark interval (11–15 ... > 40) were nearly normally distributed, the curves varying with the stand or crown class studied. Correlations between these individual tree scores and the 12 curve types are moderately high—in 4 stands  $r = \text{ca. } 0.6\text{--}0.7$  and in a 5th stand 0.411, all statistically significant. Correlations were also studied by combining the data of curves into an A-group of more favourable increment course, and a B-group of the rest. Better results were, however, got by separating a middle C-group of indeterminate increment course and correlating the now reduced, extreme A- and B-groups with the external-character scores. The 5 stands under study were in the 23- to 80-year classes. It can be accepted that greatest reliance can be put on this method of recognizing these groups during the 'plastic' period of growth (30–50 years). The superiority of the A-group over the B-group as regards c.a.i. of the older stems was shown in a series of stands. Theories of the dominating role of environment, heredity, or a combination of both, on the course of increment are discussed, the last being favoured. A table of significant correlations between the external characters (a), (c) and (d) as they vary in 6 provenances (4 foreign) is presented. An illustrated 3-figure tree-classification is given with definitions, the first figure (1–3) representing the increment-course groups, A, B, and C, the second (1–5) conventional crown classes, and the third (1–9) utilization classes based on stem quality and defects. Aided by such external recognition of the tree of potential good increment (slower early growth, later and higher peak, greater growth in the decline) thinnings should be more frequent in youth and less with increasing age, with corresponding adjustments in the amounts removed at each thinning. The raising of production in both volume and quality in a shorter time and with greater assurance must follow.

## 23. Regeneration and Formation of Stands

See also Nos. 1566, 2563.

1575. GIORDANO, G. Observations sur le traitement des mélèzeins du versant italien des alpes occidentales. [The management of Larch stands on the Italian side of the Western Alps.] *Rev. for. franç.* 9 (8/9), 1957 (625–33). [F.]

Debates the question of natural vs. artificial regeneration of Larch. In the French Alps the usual practice is to obtain natural regeneration by progressive strip felling. In Italy, the claims of grazing and the uncertainty of seed-years etc. have led to the adoption of small clear fellings followed by planting and exclusion of grazing until establishment.

### 231. Natural Regeneration

See also Nos. 1567–70, 1573.

1576. Natural regeneration. *Rep. For. Dep. Nyasald.* 1956, 1957 (17).

Profuse natural regeneration has been observed of *Pinus patula*, *P. elliottii* and *P. longifolia*, *Callitris*

*robusta* and *Cupressus lindleyi*, and it appears likely that little difficulty will be experienced in future in regenerating the common exotic conifers in Nyasaland. An example of natural regeneration of *Eucalyptus saligna* and *E. maideni* has been observed on bare mineral soil above the Mudi Dam.

1577. EICHEL, G. H. **Management of Spruce/Balsam stands towards natural regeneration.** *For. Chron.* 33 (3), 1957 (233-7).

Discusses the methods tried for encouraging the regeneration of Spruce in competition with Balsam Fir, and concludes that the only certain method would be to cut out mature and over-mature Balsam Fir well in advance of the main operations, so as to destroy the seed source. An account is also given of Eberhard's wedge system of regeneration fellings.

1578. ALEXANDER, R. R. **Damage to advance reproduction in clear-cutting Spruce-Fir.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 27, 1957. pp. 2.

In 1954, in the Fraser Experimental Forest, central Colorado, alternate strips were felled, all material  $\geq 4$  in. in diam. being cut and removed, and milliacre plots established on strips, 6 chains wide, on N. and W. aspects. The advance growth of *Picea engelmannii* and *Abies lasiocarpa* (the latter predominating) was much damaged by horse extraction, reducing the average number of seedlings and saplings from 20,570 to 6,560/acre; but this was critical only for Spruce and only on W. aspects. To reduce damage the author recommends directional felling (i.e. felling trees at an angle causing least ground disturbance when they are moved into the skidding trail), confining skidding to trails laid down before felling, and leaving high stumps along the trails.

1579. LEVANTO, S. Eräiden hevos- ja traktorivetoisten laikkurien vertailutuloksia. [Some results of comparative experiments with horse- and tractor-drawn scarifiers.] *Metsät. Aikak.* 1957 (6), (218-24). [Fie.]

Results indicate that horse-drawn scarifiers can be successfully used where the depth of the humus layer does not exceed 6 cm., but that on soils with a thick peat layer tractor-drawn scarifiers are more efficient unless the soil is too stony. *From author's summary.*

1580. ACKERMAN, R. F. **The effect of various seedbed treatments [in the forest] on the germination and survival of White Spruce and Lodgepole Pine seedlings.** *Tech. Note For. Br. Can.* No. 63, 1957. pp. 23. 16 refs.

Results of various treatments showed that trenching had no effect on germination or survival of *Picea glauca* (a), but a beneficial effect on that of *Pinus contorta* var. *latifolia* (b), showing that root competition from the residual stand is not an important factor in survival of (a) but is important to (b). Removal of ground vegetation and the driest portion of the unincorporated organic material significantly improved germination and survival of (a) but had no appreciable effect on (b). Burning the unincorporated organic material had an adverse effect on regeneration of both species.

1581. LITTLE, S., and MOHR, J. J. **Seedbed treatment increases dominance of natural Loblolly Pine reproduction.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 76, 1957. pp. 4. 2 refs.

Five years after seed-tree fellings [cf. *F.A.* 19 No. 1569] and seedbed treatments, all plots contained large amounts of Pine regeneration. The largest number of Pine seedlings dominant or equal in height to competing hardwoods and shrubs occurred on soil scarified (by a stump dragged across the surface) before felling and burned after felling; ca. 90% of the future overstorey should be Pine, compared with ca. 50% in controls. Ploughing before felling disturbed the soil too little to improve Pine regeneration significantly.

1582. SANDER, I. L. **Disking increases Shortleaf Pine reproduction but . . .** *Sta. Note Cent. St. For. Exp. Sta.* No. 111, 1957. pp. 2.

Disking after logging in a stand of *P. echinata* growing in mixture with low-quality hardwoods in the Cumberland National Forest, Kentucky, produced an average increase, after 4 years, of 605 Pine seedlings/acre over controls. The number of hardwood sprouts also increased, averaging 7800 per acre more on the disked than on the untreated plots. If the Pines are not to be overtopped, disking must be supplemented by effective hardwood control.

1583. GODMAN, R. M. **Disking increases the number and growth of Yellow Birch seedlings.** *Tech. Note Lake St. For. Exp. Sta.* No. 511, 1957. pp. 2.

The survival and growth of Yellow Birch seedlings after 3 years in a heavily cut Birch/Hemlock stand in Michigan showed a definite correlation with disking intensity. Most regeneration was found on plots with 75% of the area disked, and seedlings on these plots also had the best height growth.

1584. SCHOLZ, H. F., and DEVRIEND, A. J. **Natural regeneration on a 2-acre mixed-Oak clear cutting five years after logging.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 48, 1957. pp. 11. 3 refs.

In E. Wisconsin two acres in a well stocked 90-year stand of mixed hardwoods, in which *Quercus rubra* predominated, were clear felled in 1949 after producing a heavy seed crop, and the resulting regeneration was studied on milliacre plots. Data on the species composition of the original stand and on the regeneration 2 and 6 years after felling are tabulated. In these 4 years a 69% reduction in the stocking of Red Oak occurred in favour of inferior hardwoods; this tendency was particularly marked in the last 3 years. As the remaining Red Oak seedlings (totalling 1220/acre) show good growth, it is assumed that they will eventually out-strip competing shrubs and provide an adequate stand.

1585. SOEPONO [SUPONO], R., and ARDIWINATA, B. Beberapa segi silvikultur dari pекerђaan mekanisasi dalam hutan Dipterocarpaceae di Mentawir (Balikpapan). [Some silvicultural aspects of mechanical logging in the Dipterocarp forest of Mentawir near Balikpapan.] *Commun. For. Res. Inst., Bogor* No. 58, 1957. pp. 22. 10 refs. [Jav.jav.e.]

Discusses the composition of the forest and the



effect of tractor logging on regeneration of economic species, concluding that tractor tracks covering about 30% of the area of exploitation do not affect regeneration unfavourably. *From authors' summary.*

1586. GROSE, R. J. A study of some factors associated with the natural regeneration of Alpine Ash, *Eucalyptus delegatensis* R. T. Baker, syn. *E. gigantea* Hook. f. *Bull. For. Comm. Vict.* No. 4, 1957. pp. 22. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

1587. [Natural regeneration of conifers from coppice regrowth.] *Unasylva* 11 (4), 1957 (193).

Clear felling of an area of *Pinus gerardiana* and *Cedrus deodara* in Afghanistan some years ago has been followed by good regeneration of both species from coppice regrowth; 4-5 stems 3-6 m. high were found round most stumps, the Pine coppice was setting seed, and some seedling Pine was found.

1588. MCINTOSH, D. Tiv N.A. No. 3 Mbakon Forest Reserve. *Inform. Bull. Dep. For. Res. Nigeria* No. 44, 1957. pp. 3.

A formerly cultivated tract in the Guinea savanna, completely protected from fire for 10 years, carried root-sucker regeneration 10-15 ft. high (7 named species). Early-burned for the following ten years, it now carries densely stocked *Isobertinia doka* of 5-10 in. diameter and 30-35 ft. high with a few *Khaya senegalensis* of similar form. Yields of fuelwood are about 11.5 cords/acre.

### 232. Artificial Regeneration

1589. POURTET, J. La mécanisation des travaux de boisement et de reboisement. [The mechanization of plantation and afforestation work.] *Bull. Soc. for. Belg.* 64 (10), 1957 (417-38). [F.]

A lecture, dealing with clearing and cultivation of the planting site, hole-digging, and the use of planting machines.

1590. PARRY, M. S. Tree planting practices in tropical Africa. *FAO For. Developm. Pap.* No. 8, 1956. pp. 306. 72 refs.

This paper, one of the geographical sections of the *World Forest Planting Manual* [cf. *F.A.* 16 No. 3978; 17 No. 3809] deals with seed, nursery, and planting practices in the tropical zone of Africa. These practices are, in many instances, still in the development stage, but the author has outlined those methods most commonly employed and has summarized the characteristics of the species most frequently planted in the region.

1591. FERGUSON, K. V. M. Tree planting guide, with particular reference to selection and planting of trees on farms in Victoria. *Misc. Publ. For. Comm. Vict.* No. 5, 1957. pp. 56 + 21 photos. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Revision of *Leaflet For. Comm. Vict.* No. 3, 1945 [cf. *F.A.* 10 No. 999].

1592. ANDRADE, D. XAVIER DE. Considerações sobre a cultura do cedro. [The cultivation of Cedar.]

*An. bras. Econ. flor., Inst. nac. Pinho* No. 9, 1957 (122-30). 12 refs. [Port.port.e.]

Notes on artificial regeneration of *Cedrela fissilis* in the region of Brejo, Parahyba. Owing to lack of natural regeneration and the great demand for its timber, the tree is becoming scarce throughout tropical America. It requires a soil rich in Ca(0.5-2%) with plenty of organic matter (7-12%), good drainage, and a pH of 6.9-7.7. Mixed plantations affording lateral shade to the Cedar are recommended. Trials are in progress in N. Brazil of planting in mixture with *Syzygium jambolanum*.

1593. MAGNANINI, A., and FILHO, A. COIMBRA. Como reflorestar com a 'peroba de Campos'. [How to reforest with *Paratecoma peroba*.] *Brasil madeireiro* 12 (120), 1957 (40-2). [Port.]

Instructions for raising it from seed and planting out.

### 232.1. Choice and Trial of Species, Races etc.

See also Nos. 1301, 1350, 1476, 1699 *et seq.*, 1758, 2550.

1594. LUIĆ, R. Kulture pitomog kestena u Grdeličkoj Klisuri. [Plantations of *Castanea sativa* at Grdelička Klisura [Serbia].] *Šumarstvo* 10 (5/6), 1957 (385-8). [Serb.]

After 6 years, 1 × 1.5 m. plantations of *C. sativa*, pure and mixed with *Juglans regia*, showed on a total area of 5 ha. good survival and growth despite (a) growing on a shallow alkaline soil and (b) a drought summer the previous year which had killed associated species. Max. height was 5.3 m. *C. sativa* grew best in dense pure stands. Recommendations are made on planting techniques.

### 232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 1576, 1625, 1860, 2149, 2563.

1595. HEIKINHEIMO, O. Tuloksia ulkomaisten puulajien viljelystä Suomessa. [Results of some trials of exotics in Finland.] *Commun. Inst. for. Fenn.* 46 (3), 1956 (1957). pp. 129. 38 refs. [Fi.g.]

Includes tabulated data, for 104 species and varieties, on site, age and area of plantations, frost hardness, age of trees 6 m. high, maximum height, d.b.h. of dominants, and volume. [Cf. *F.A.* 18 No. 3909.]

1596. OKSBJERG, E. Om *Picea orientalis*. [*P. orientalis*.] *Dansk Skovforen. Tidsskr.* 42 (11), 1957 (547-74). 7 refs. [Dan.dan.]

Discusses the range and site requirements of *P. orientalis* and its growth in stands in Jutland and Germany. Concludes that, while its increment pattern in general resembles that of *P. abies*, its height increment is less affected by good and bad seasons, and it is better suited to growth in shade. It deserves to be more widely grown in Denmark, e.g. for Christmas trees.

1597. JOHNSON, H. Några data från försökskulturer med nordamerikansk tall. [Some data from experimental plantations of North American Pines.] *Svenska SkogsvFören. Tidsskr.* 55 (4), 1957

(345-58). 10 refs. [Sw.sw.] Also in *Årsberätt. Fören. Växtförädl. Skogsträd* 1956 (23-36).

Presents data from 4 plantations established in 1942-44, from seed collected in 1938 in the U.S.A. and Canada, composed of some or all of the following: *Pinus banksiana*, *P. contorta* var. *latifolia*, *P. ponderosa*, *P. strobus*, *P. resinosa* and *P. monticola*. *P. monticola* and *P. resinosa* failed completely and are considered unsuitable for Sweden. *P. ponderosa* was satisfactory in the most southerly plantation, where one provenance from British Columbia grew as well as native Pine; on the only other site where it was tried *P. ponderosa* did very poorly. *P. strobus* also did poorly, but other experiments have shown that it can succeed in suitable localities. *P. banksiana* (only one provenance) grew better than native Pines on the southerly site but proved very susceptible to snow blight on the more northerly ones. *P. contorta* var. *latifolia* was the most successful of the species tried and grew well in all 4 plantations; two provenances from British Columbia proved superior to those from Saskatchewan, Idaho and Montana. No specific differences in dry-matter content were found between *P. sylvestris*, *P. banksiana*, *P. contorta* and *P. ponderosa*.

1598. LINES, R. *Pinus contorta* in Ireland, 1955. *Forestry* 30 (2), 1957 (139-50 + 4 photos). 6 refs.

A short study of some of the older plantations of *P. contorta*, a species planted freely on infertile soil in Ireland since 1918, made in connexion with planting and with provenance experiments in Great Britain. The author distinguishes only three types planted in Ireland, the familiar South Coastal and North Interior types and an intermediate type called Rainer Forest, to which there is no parallel type in Great Britain. The types are discussed under growth rate, site influence, spacing, susceptibility to sawfly attack, mixtures, thinning treatment, and windblow. In Eire, the fast-growing South Coastal type is preferred and is usually planted pure as a pioneer crop, whereas in Northern Ireland both Coastal and Interior types have often been planted in mixture with *Picea sitchensis*. The choice of type and the practice adopted in Eire seem to be the more successful. *From author's summary.*

1599. GÜNTHER, H. Gebirgspappeln. [Mountain Poplars.] *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (Beitr. Pappelforsch. No. 2), 1957 (1-33). 6 refs. [G.g.]

Describes isolated trees or groups of *Populus trichocarpa*, *P. tacamahaca* and some not clearly identified Black Poplar hybrids, aged about 9 to 60 years, at altitudes of ca. 600-900 m. on the N. slope of the Erzgebirge, their habit, stem form, morphology, height and diameter, and width of annual rings, giving climatic, topographical and soil data for the sites. Some of the trees, particularly those of the section *Tacamahaca*, showed very good growth and stem form under severe conditions, and were largely free from pests or fungi and resistant to snow and frost. *P. trichocarpa*, in spite of its unsatisfactory record in lower parts of E. Germany, is considered worthy of further research and breeding for use as a mountain Poplar.

1600. MOGGI, G. Bibliografia italiana sul genere *Eucalyptus*. [Bibliography of Italian literature on the genus *Eucalyptus*.] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (55-64). 104 refs. [It.E.] (1st World *Eucalyptus* Conference, Rome, 1956.)

1601. MOGGI, G. Inventario delle specie del genere *Eucalyptus* esistenti in Italia. [Inventory of *Eucalyptus* spp. in Italy.] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (5-53 + 11 photos, 1 map). 96 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

After a general account of the introduction of Eucalypts into Italy, an inventory by provinces is given. The total number of species is 60.

1602. KRISHNASWAMY, V. S. *Eucalyptus* in Madras state. Madras Forest Department. 1957. pp. 8. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the species tried at various times, and regeneration by sowing or from coppicing, nursery practice, tending, growth and uses, of *E. globulus*, of which there are some 2000 acres in the Nilgiris, and gives some data on results with *E. citriodora* [cf. F.A. 18 No. 3921], *E. rostrata*, *E. robusta* and *E. saligna*.

1603. DABRAL, S. N. Notes on some of the exotic forest species established in India. Forest Research Institute, Dehra Dun. 1957. pp. 12. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses sowing and planting techniques, natural regeneration and yields of *Acacia decurrens* var. *mollissima*, *Eucalyptus* spp., *Prosopis* spp. and *Cryptomeria japonica* in India, and lists some 70 exotic species successfully introduced.

1604. KRISHNASWAMY, V. S. The Wattles or the exotic Acacias of Australia introduced in Madras State. Madras Forest Department. 1957. pp. 8. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Requirements, silvicultural characteristics and uses of *A. dealbata*, *A. decurrens*, *A.d.* var. *mollissima*, and *A. melanoxylon*.

1605. KRISHNASWAMY, V. S. *Prosopis juliflora*. Madras Forest Department. 1957. pp. 4. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Describes the species and discusses its introduction, growth, and uses in India, especially the use of the pods for stock feed.

1606. KENG, G. Q. Propagation of English Cricket Bat Willow in Kashmir valley. *Indian For.* 83 (12), 1957 (707-10 + 6 photos). 3 refs.

1607. Experimental introductions. *Rep. Dep. Agric. Seychelles* 1956 [1957], (15-6).

Short notes on trial sowings of *Intsia bakeri*, *Chlorophora excelsa*, *Khaya* spp., *Widdringtonia whytei*, *Pinus* spp., *Tectona grandis* and *Ochroma lagopus*.



1608. **Exotic forest trees in the Australian Capital Territory.** Forestry and Timber Bureau, Canberra, 1957. pp. 44 + 13 photos. 24 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

1609. ROGERS, L. J. **Exotic forest trees in Queensland.** Queensland Forestry Department, 1957. pp. 27. 4 tbs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses climatic and soil factors in the areas where exotics have been planted, techniques of establishment and results by species for *Pinus* spp.

1610. LEWIS, N. B. **Silviculture of exotic plantation species in South Australia.** *Bull. Wds. For. Dep. S. Aust.* No. 5, 1957. pp. 24. 22 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

The chief species discussed are *Eucalyptus* spp. from other parts of Australia and *Pinus* spp., especially *P. radiata*.

1611. THOMAS, J. **Growth problems of *Pinus radiata* in South Australia.** *Aust. For.* 21 (1), 1957 (23-9).

Discusses some of the problems that have occurred, or may occur, in exotic plantations, e.g. nutrient deficiencies, protection from fire and insects, genetical factors, and possible soil degradation.

1612. HARRIS, A. C. **Report on exotic conifers in Western Australia.** Government Printer, Perth, 1957. pp. 22. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Deals with *Pinus pinaster*, *P. radiata*, *P. halepensis* var. *brutia*, *P. caribaea* and *P. elliottii*.

1613. **The principal exotic forest trees in New South Wales.** Forestry Commission of New South Wales, Sydney, 1957. pp. 13. 2 refs. (Seventh British Commonwealth Forestry Commission, Australia and New Zealand, 1957.)

Deals mainly with *Pinus radiata* and *P. elliottii*.

1614. RAWLINGS, G. B. **The pathology of *Pinus radiata* as an exotic.** New Zealand Forest Service, Wellington, 1957. pp. 16. 36 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses its natural range and requirements, and the diseases, injuries and insect attacks that may affect it, with particular reference to conditions in New Zealand.

1615. WESTON, G. C. **Exotic forest trees in New Zealand.** New Zealand Forest Service, Wellington, 1957. pp. xxvii + 104 + 8 photos, 2 maps. 45 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

A comprehensive account, with data on climate, soils, and techniques of establishment, and a list of > 120 species tried, with detailed notes for each, on areas, climates, sites, establishment, tending, growth, pathology, regeneration, timber, potentialities etc.

## 232.12. Races and Provenance Trials

See also section 165 and Nos. 1453, 1467, 1597-8, 1771, 1979.

1616. GØHRN, V. **Standardprovenienser. [Standard provenances.]** *Dansk Skovforen. Tidsskr.* 42 (10), 1957 (544-6). [Dan.]

As a result of a meeting of representatives of the major institutions engaged in provenance trials, a list is given of standard provenances (one or at most 2 for each of 19 important species) to be included as a standard for comparison in future provenance trials.

1617. GØHRN, V. **Provenienseforsøg med lærk. [Provenance trials with Larch.]** *Forstl. Forsøgsv. Danm.* 23 (1), 1956 (1-124). 6 refs. [Dan.dan.e.] A shortened version of this article appears in *Dansk Skovforen. Tidsskr.* 42 (6), 1957 (305-9).

Provenance trials were laid out on 8 experimental areas between 1916 and 1944, covering 46 provenances of *Larix decidua*, 1 of *L. sibirica*, 9 of *L. gmelini*, 3 of *L. leptolepis* and 2 of the controlled hybrid *L. leptolepis* × *L. decidua*. Recent examination showed that: provenances of *L. decidua* from the Alpine region (1) were susceptible to canker (*Dasyctypha willkommii*) and on the whole grew slowly but had good stem form; the one from Scotland (2) varied in susceptibility to canker, grew more rapidly than (1) and showed good stem form; Norwegian and Swedish provenances (3) resembled (2); Danish material (4) was too scanty for definite results, but grew rather faster and was less susceptible to canker than (2) and (3) but had poorer stem form; Carpathian provenances (5) were somewhat inferior to (4); Sudeten and Moravian provenances (6) and (7) grew slightly faster than (2) and (5) and appreciably faster than (1), were less susceptible to canker than (2) and (1) and slightly less than (5), and had poorer stem form than (1), (2), or (3). Polish provenances varied; those from Zagańsk and Skarżysko grew fast, were resistant to canker and had fair to good stem form, while that from Chelmowa Góra was inferior in all respects. *L. sibirica* has died completely in one area and only a few trees have survived in the other. Two provenances of *L. gmelini*, both from Korea, have good stem form and are resistant to canker; in one area volume/ha. of one provenance is below that of neighbouring *L. leptolepis* and *L. decidua* (Poland), and in 3 areas height growth of the other provenance is equal to *L. decidua* (2) and (3). Two provenances of *L. leptolepis* differed very little in growth rate. *L. leptolepis* × *L. decidua* has good growth rate and stem form but a certain amount of stem canker in an area where attack by canker is very heavy. Stem form, especially of *L. decidua* (5) and (6) tended to vary with the site, being better on mull-deficient soil than on soil rich in N.

1618. KRIEBEL, H. B. **Drought-hardy strains extend planting of Sugar Maple.** *Ohio Farm and Home Research, Wooster, Ohio* 41 (300), 1956 (35, 38). C.G.B.

Tests at the Ohio Agricultural Experiment Station showed that provenances from S. Illinois and the deep South were hardiest, but trees from

S.W. Ohio were nearly as hardy and better in form. With proper selections and treatment (mulching with sawdust to conserve moisture, adding fertilizer to prevent N losses), Sugar Maple can be planted successfully outside its natural range.

### 232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

1619. BRÜCKMANN, H. H. Observaciones epidémicas sobre especies e híbridos de *Populus* en el Paraná Mini, islas del Delta del Paraná. [Growth studies on Poplar species and hybrids in Paraná Mini, islands of the Paraná Delta.] *Rev. for. argent.* 1 (4), 1957 (136-9). [Span.]

Comparisons of increment of different species and of various clones of *Populus*  $\times$  *eueroamericana* show the superior height growth (up to the age of 77 years) of clone I-154 and (up to the age of 4 years) of clone I-214. The importance of drainage was demonstrated by the growth of Poplars near drainage ditches. All clones, but especially clone I-214, showed a decline in rate of growth from the fourth growing season onwards. In the case of I-214, however, the decline in growth is offset by its greater canker-resistance. A thinning shortly before or during the fourth growing season is recommended, in order to prevent this falling-off in growth.

### 232.2. Preparatory Work. Auxiliary Measures

See also Nos. 1589, 1717, 1731, 1788-9, 2180, 2605-6.  
1620. Ashbed effect. *Rep. For. Dep. W. Aust.* 1956/57, 1957 (22-4).

Experiments are in progress on the effect of burning on seed germination, seedling survival and weed competition. The effect of an ashbed from a recent burn was striking. Karri [*Eucalyptus diversicolor*] seedlings at 1 year old on ashbeds (a) were 5-10 times as tall as those in controls (b). In direct sowing of Tuart [*E. gomphocephala*], though germination was very similar on (a) and (b), survival at 1 year was 38% and 2% respectively; and (a) seedlings were better developed and more vigorous; seedlings planted out on (a) also showed better survival than on (b) (70% and 24% respectively). Weed competition on (b) was ca. 15 times that on (a). Analysis of plantation soils from ashbeds of various ages showed that in the surface soil (0-1 in.) N gradually increases for at least 20 years after the burn, and pH decreases rapidly for the first few years (from 8.4 to 7.3 in 5 years and then to 6.4 in 20 years). Water-soluble salts also decrease rapidly and are leached from the surface soil in the first 5 years. The ashbed seems to have no effect on the underlying horizons.

1621. SHAW, R. G., HOLMES, G. D., and MILLER, A. D. Problems of land reclamation. 6. Clearing scrub vegetation. *Agricultural Review*, London 3 (2), 1957 (31-6). O.R.E.

Discusses equipment and methods, mechanical and chemical; their costs; soils and vegetation; and the future land-use for which they are suitable. Describes an inexpensive method suitable for

reforestation, whereby a series of lanes ca. 12 ft. wide are cleared with a V-shaped grubber blade, leaving scrub and debris in between in windrows 6-8 ft. wide. These help to protect the young trees.

1622. BURCKHARDT. Vollumbruch und Maschineneinsatz bei Aufforstung von Grosskahlfächen im Forstbezirk Karlsruhe-Hardt. [Complete ploughing of large clear fellings and mechanization in afforestation in the Karlsruhe-Hardt forest district.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (105-9). [G.]

Describes site preparation (stump grubbing, ploughing ca. 40 cm. deep, harrowing etc.) often combined with the spreading of BHC, mechanical planting, sowing, hoeing etc., and equipment used. The plantations were more resistant to frost, drought, disease etc. than those established by strip ploughing. Chief species were Pine and occasionally Oak, both mixed with other species. [Cf. F.A. 15 No. 1317.]

1623. SÖDERSTRÖM, V. Några orienterande studier angående markfuktigheten i plantrutor och under hyggesvegetation. [Preliminary studies of soil moisture in planting spots and under vegetation on clear-felled areas.] *Svenska Skogsvätern. Tidskr.* 55 (5), 1957 (483-504). 10 refs. [Sw.]

Measurements of soil moisture were made in the summers of 1955 and 1956 in areas free of vegetation, in planting spots and in clear-felled areas covered with grass, bracken etc. In dry periods drying-out was greater under vegetation than on scarified planting spots. On sites free of vegetation but with a humus layer, moisture content was usually high immediately below the humus, decreasing rapidly to a depth of ca. 20 cm. On similar sites covered with vegetation, moisture content was low immediately below the humus, increasing slowly at lower levels. Preliminary conclusions are that on grassy clear-felled areas, especially on clay in districts with low rainfall, scarification is desirable. If the site is not scarified, shallow planting is better on sites with scanty vegetation and deeper planting on those where vegetation is denser.

1624. WALTER. Kombination des Pappelanbaus mit landwirtschaftlicher Zwischennutzung. [A combination of Poplar growing with agricultural intercropping.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (14-5) [G.]

Describes a system practised in the Elbe and Saale flood-plains, in which the forestry department does the actual planting, but all tending is incidental to the growing of root crops between the rows by (mostly part-time) gardeners, who are allowed to do this in return for keeping the land well hoed and free from weeds. Results are said to be excellent. Intercropping is possible for ca. 6 years.

1625. NAIDU, K. K. Past, present and future of planting Teak in the Andamans. *Indian For.* 83 (9), 1957 (539-45 + 2 photos). 5 refs.

Teak planting was abandoned some 25 years ago, but recent trials, using modern techniques, show promise. Recommended methods are careful choice



of site, pre-monsoon planting preceded by clear-felling, burning, and interplanting with a crop of hill paddy.

### 232.3. Seed, Nursery Practice, Direct Sowing

#### 232.31. Seed

##### 232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 1379, 1387, 1392, 1499-1501, 1678, 1723, 2011-2, 2090-1.

1626. TOMPA, K. Az erdeifenyő 1955. évi magtermése Sopron környékén. [The 1955 cone yield of *Pinus sylvestris* round Sopron.] *Erdőmérn. Föisk. Közl.* 1956 (2), (127-41). 14 refs. [Hu.hu.russ.g.]

The author evaluates the various methods of cone estimation and recommends H. Messer's [see *F.A.* 17 No. 2696] as simple, quick, practical and consonant with the requirements of modern management. He uses this method to determine the yield of a Sopron stand, with illustrations of the crown analysis involved; data are tabulated for cone yield from the N. and S. sides of the crown, in 2-m. layers and also per branch, per running metre of branch, per whorl, and per 2 sq. m. of vertical crown projection. Seed production from the N. and S. sides of the tree at different dates are used in calculations to fix a critical date on which to begin collecting cones.

1627. RUMMUKAINEN, U. Kämpysadon arvioinnista. [Estimating cone crops.] *Commun. Inst. for. Fenn.* 46 (7), 1956 (1957). pp. 30. 27 refs. [Fi.g.g.]

Since the beginning of the present century, an annual survey of Spruce and Pine cone crops has been made by assessors who classify the crop in each stand, from general observation, as none, poor, middling, fairly good, and good. A new and more accurate method has now been adopted, by which a count is made of the number of cones on the south side of the crown of 10 mature, dominant trees in each stand.

1628. SARVAS, R. Studies on the seed setting of Norway Spruce. *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (529-56). 62 refs. [E.e.]

Data available for S. Finland for 30 years suggest that good Spruce seed-years occur at intervals of 12-13 years and that between the peak years there may be, on average, one other year in which cone collection would be worth while. Regional variations are considerable, amounts of seed decreasing further north. The chief cause of empty seeds appeared to be insufficient pollination, and the proportion of empty seeds generally rose in poor seed-years. Regional differences in filled seed% were small.

1629. Douglas Fir cones increased in U.S. experiments. *B.C. Lumberm.* 41 (9), 1957 (16).

Notes on the Weyerhaeuser Timber Company's experiments at Yacolt and Chehalis, Wash. Treatments with N and P raised cone production from 3 to 18 bushels/acre with a 20% increase of good seed.

Aluminium-sheet sleeves, 18 in. long, placed on the trunks from late August till December prevent theft of ripening cones by squirrels [cf. *F.A.* 19 No. 646].

1630. HOEKSTRA, P. E., and MERGEN, F. Experimental induction of female flowers on young Slash Pine. *J. For.* 55 (11), 1957 (827-31). 10 refs.

Methods for stimulating early and abundant flowering were tested in two studies on 7- and 21-year Slash Pine located on light sandy soils in N. Florida. On 7-year trees, root pruning, stem injury and application of 5 lb. of 3-12-6 fertilizer per tree each increased the number of trees that bore ♀ flowers. In the stem-injury treatments, partial girdling was more effective than strangulation by wire. On 21-year trees partial girdling increased the number of ♀ flowers. Of the two types of fertilizer tested, 20 lb. per tree of a 7-7-7 mixture stimulated flowering, whereas the same dosage of a 3-18-6 mixture had no effect. Doubling the application to 40 lb. per tree showed no additional effect with the 7-7-7 fertilizer but increased the flower crop with the 3-18-6 mixture. *Authors' summary.*

1631. Induction of flowering in *Pinus radiata*. *Rep. For. Timb. Bur. Aust.* 1956, 1957 (25).

Root-pruning stimulated cone production in the year following treatment, but the long-term effect was unfavourable, and 6 years after treatment the controls were more vigorous and had produced 50% more cones than treated trees. Strangulation with iron collars for 4 years did not stimulate cone production. Application of 5 lb. superphosphate per tree appeared to stimulate cone production in the following year, but the effect had worn off 6 years later, though diameter of treated trees was 30% greater than that of controls.

1632. BÁNÓ, I. A magyar fenyőmagtermőplántás. [Development of Hungarian seed orchards.] *Erdész. Kutatás., Budapest* 1957 (1/2), (31-48). [Hu.russ.e.g.]

More than 20 ha. have been planted in 5 years. The species/number of clones/number of grafts/ and % take of grafts are respectively: *Pinus sylvestris* /336/21,538/79; *P. nigra* var. *austriaca* /14/299/64; *Larix decidua* /28/1003/62; *Picea abies* /8/316/85; *P. omorika* /3/505/49; *Pseudotsuga taxifolia* /32/650/97. Scions stored under snow kept excellently. At 4 years, of 3682 grafts of Scots Pine, 2438 (66.4%) had flowers. The total number of ♀ flowers was 21,169 (5.75 per graft), nearly four times the number in the previous year. Of artificially pollinated flowers, 67% had produced small cones.

1633. SPÎRCHÉZ, Z., et al. Sporirea recoltelor de ghindă în rezervațiile de semințe. [Increased yields of acorns from elite stands.] *Rev. Pădurilor* 1957 (10), (632-5). 5 refs. [Rum.russ.g.f.e.]

Observations at several research stations have shown that there is no regular difference from year to year in intensity of flowering of *Quercus robur* or *Q. sessiliflora* and that differences in acorn production are due to drought, cold, insect defoliation etc. Experiments were made with various methods of increasing yields, e.g. thinning, underplanting, soil scarification, fertilizing; results are tabulated.

1634. ROY, D. F. A record of Tanoak [*Lithocarpus densiflorus*] acorn and seedling production in California. *For. Res. Note Calif. For. Range Exp. Sta.* No. 124, 1957. pp. 6. 3 refs.

### 232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 1626, 1644.

1635. CRAM, W. H., and WORDEN, H. A. Maturity of White Spruce cones and seed. *For. Sci.* 3 (3), 1957 (263-9). 6 refs.

Specific gravity and moisture content are positively correlated (0.98) in the cones of *Picea glauca*, both providing accurate indices of maturity in cone and seed. At Indian Head, Saskatchewan, natural dispersal occurs at the end of August or beginning of September, about 98 days after pollen-shed (21-31 May). Tests should begin 90 days from pollen-shed, with random samples of 6-10 cones per tree. For sp. gr. the mean from 6, and for m.c. the mean from 3 pairs of cones are sufficient. For breeding programmes, cones should be collected when m.c. or sp. gr. in open-pollinated cones has fallen to 48% or 0.74% respectively. For commercial seed, 9 out of 10 fresh cones should float in turpentine or 8 in kerosene. Size of seed, yield, and germination, increase in the last 4 weeks before dispersal and the maximum yield of seedlings per cone is got from harvesting 3-6 days before this date.

1636. MÁTYÁS, V. Az infravörös sugárzás alkalmazásának lehetőségei az erdészeti maggyazdálkodásban. [The applicability of infra-red rays in forest seed management.] *Erdész. Kutatás., Budapest* 1956 (4), (185-203). [Hu.russ.e.g.]

Describes preliminary tests for effects on the ripening and extraction of seeds. Sub-infra-red radiation increased the weight of embryos. Infra-red rays facilitated extraction of seed in Larch; these rays may be useful in the drying of washed seed, of acorns before transport, and of Poplar seed.

1637. TAKÁCS, P. P. Irányelvek infravörös berendezések tervezéséhez. [Principles for planning infra-red ray centres.] *Erdész. Kutatás., Budapest* 1956 (4), (205-11). [Hu.]

Supplementary to a previous article [see preceding abstract].

1638. HUSS, E. Skogsfröets avvingning i några moderna vingnötare. [De-winging tree seed in some modern de-winging machines.] *Svenska Skogsv-Fören. Tidskr.* 55 (4), 1957 (359-74). 1 ref. [Sw.]

Seven Swedish and German models, described with illustrations, were tested with Pine and Spruce seed and the results compared with de-winging by hand. The tabulated results of germination tests suggest that with normal length and severity of treatment no serious damage is done to the seed by any of the methods.

### 232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

1639. Report of the Committee on Transactions in Seeds, presented to Parliament. . . . November

1957. H.M. Stationery Office, London. *Cmnd.* 300, 1957. pp. 128. Price 5s.

Includes a section (Ch. X, pp. 74-7) on forest tree seeds. The recommendations include (in principle) the establishment of seed certification schemes, and the regulation of sample size for forest tree seed testing by the International Rules for Seed Testing, which would involve some increase in sample size.

1640. ROSSMÄSSLER. Das Gesetz über forstliches Saat- und Pflanzgut vom 25. September 1957. [The law on forest seed and planting stock of 25 Sept. 1957.] *Forst- u. Holzw.* 12 (21), 1957 (366-8). [G.]

Discusses the main features of the new Federal enactment, particularly where they differ from the law of 13 Dec. '34 and its administrative regulations, which it replaces, covering the registration of 'approved' stands or trees, the requirements of obligatory certificates for forest seeds and plants (including Poplars), import restrictions etc.

1641. ROHMEDE, E. Inhalt und kritische Bewertung des neuen Gesetzes über forstliches Saat- und Pflanzgut. [The content of the new [Federal German] law dealing with forest seed and planting stock, and a critical appraisal of it.] *Forstarchiv* 28 (11), 1957 (228-31). [G.g.]

1642. Producción y consumo de semillas forestales—año 1954-55. [Production and consumption of forest seed.] Servicio de Semillas Forestales, Madrid. 1956. pp. 113. [Span.]

A report put out annually by the service, presenting figures for production of seed 1954-55 and consumption (including imports) during 1955, for the whole of Spain.

### 232.315. Seed Storage and Treatment

See also Nos. 1502, 1636-7, 1648-9, 1685-6, 1928, 2605.

1643. STONE, E. C. The effect of seed storage on seedling survival of Sugar Pine. *J. For.* 55 (11), 1957 (816-20). 14 refs.

A series of experiments were made on seed of *Pinus lambertiana* to test the effect of (a) the removal of the outer and inner seed-coats, and (b) storage, on germination, and also to determine seedling survival in the presence of different amounts of soil moisture. Treatment (a) accelerated germination of fresh seed in the same way as stratification; but after 2 years' storage at 36° F. it was less effective in hastening germination than 90 days' stratification in moist vermiculite at 36°; (b) retarded both the germination and the subsequent radicle elongation of unstratified seed. While stratification eliminated this retarding effect on germination, it could only partially reduce it for radicle elongation. When the seeds were stratified, storage temperature had no apparent effect on germination, but storage at 0° hastened radicle elongation compared with temperatures of 36° and 77°. Unstratified seed stored at 0° showed significantly better germination than when stored at 36° or 77°. Survival in a greenhouse of seedlings developed from fresh seeds was the same in soil watered once in 2 months as in soil watered 3 times a week for 2 months, whereas the



survival of seedlings developed from stored seed was much lower in the soil watered once only.

1644. BARNER, H., and DALSKOV, F. Notes on storage of Douglas Fir seed. *Proceedings of the International Seed Testing Association, Copenhagen* 20 (1), 1955 (57-61). [E.] L.S.

Describes tests at the Danish State Seed-Testing Station with seed shipped in the cones from U.S.A., extracted at 45° C. and de-winged either by hand (a) or by machine (b). Germination tests after 6 months' to 4 years' storage in air-tight containers showed that, at a constant temperature of 4° C., germination %s remained fairly constant for (a) and (b). When the seed was stored in a cellar under temperatures varying between 8° and 13°, germination capacity decreased, slightly for (a) and markedly for (b).

1645. GROSE, R. J. Notes on dormancy and effects of stratification on germination of some Eucalypt seeds. *Bull. For. Comm. Vict.* No. 3, 1957, pp. 23. 5 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

[Cf. F.A. 19 No. 1502.] Stratification at 40° F. promotes germination of some dormant Eucalypt seeds and increases the germination rate of seeds that exhibit the feature of delayed germination. The primary dormancy of some Eucalypt seeds is strengthened by moist storage at temperatures  $\geq 63^\circ$ . Temperature conditions unfavourable for germination of stratified seeds often induce a secondary dormancy in the embryos. Stratification widens the range of temperatures within which the seeds of some species will germinate. Non-stratified seeds of *E. delegatensis* will not germinate at temperatures  $> 70^\circ$ , but some seeds stratified for 4 weeks will germinate at 85°. Seeds of *E. delegatensis* and *E. niphophila* germinate at the stratification temperature of 40° after ca. 10 weeks. There appears to be some relationship between degree of dormancy of a seed-lot and elevation above sea level of its source. Progress in the removal of dormancy from *E. delegatensis* seeds overwintered in the field is described. *From author's summary.*

1646. JAHNEL, H. Beiträge zum Stratifizieren von Forstsaatgut. III. [The stratification of forest seed. III.] *Angew. Bot.* 31 (5), 1957 (159-65). 5 refs. [G.g.] E.M.B.

Investigations were made on seed of *Tilia cordata* in 1954-55. Fruit from an early harvesting (Sept. 15) with the seed-coat still soft had a higher % (11-15) of decayed seed after stratification than ripe fruit harvested on Oct. 20 or Nov. 7 (4-10%). Nevertheless, the earlier the seed was harvested, and the longer it was stratified, the better the germination capacity and energy. Best results were got with seed stratified for 30 weeks. Leaving seed to lie for 28 weeks in the soil out of doors was no adequate substitute for stratification. [Cf. F.A. 18 No. 1508.]

1647. RUBȚOV, S., and CARNIAȚSCHI, A. Calitatea puieților de stejar în funcție de sistemul lor

radicular. [The quality of Oak seedlings as a function of their root system.] *Rev. Pădurilor* 1957 (10), (628-31). 5 refs. [Rum.russ.g.f.e.]

Experiments were made with several methods of treating acorns (soaking in hot water or in a 1.2% solution of formalin, for varying periods) in order to promote forking of the roots. Several of these were successful, but are not of practical value since it was found that untreated controls with a single tap-root did quite as well as plants with induced root forking.

### 232.318. Seed Testing. Germination Tests. Seed Quality

1648. ROHMEDER, E. Eigenschaften des Weymouthkiefernasaatgutes. [The properties of *Pinus strobus* seed.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (113-6). 14 refs. [G.g.]

Presents graphs of germination development of ca. 300 batches of ca. 300 seeds each, some pre-treated by cold and wet storage [cf. F.A. 1, p. 161], some not. The effect of the treatment was less uniformly successful in promoting germination than in earlier tests, and it is recommended that both pre-treated and untreated seed be used in testing, particularly for seed of poorer quality. *From author's summary.*

### 232.32. Plant Rearing. Nursery Practice

1649. MÖRMANN, Erfahrungen in der Exotenanzucht. [Experiences with the raising of exotics [in Germany].] *Allg. Forstzeitschr.* 11 (8/9), 1956 (116-8). 6 refs. [G.]

Deals with (1) *Liriodendron tulipifera*, (2) *Tsuga heterophylla*, (3) *Abies concolor*, (4) *Pseudotsuga taxifolia*, and (5) *Thuja plicata*. For (1) stratification and sowing in spring or the following autumn proved best. For (2) autumn sowing gave stronger seedlings. For (3) 2-year-old seed from the U.S.A., deep-frozen, at least equalled the original germination %. (4) showed great power of recuperation after frost when cut back. (5) responded best if transplanted in spring.

1650. THÜMLER, K. Die Vermehrung der Aspe, *Populus tremula* L. [Propagation of *P. tremula*.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (2-7). 24 refs. [G.g.]

Discusses, chiefly on the basis of German literature, methods of sexual and vegetative propagation of Aspen, a species considered suitable for interim or advance plantings on sites for which no suitable seed of the main crop species is available.

1651. BADHWAR, R. L., et al. *Rauwolfia serpentina*: further studies on methods of propagation and their effect on root production. *Indian For. Leaflet* No. 158, 1957. pp. 7. 5 refs.

Root production of 2-year plants raised from seed is higher than that of plants propagated vegetatively (4.6 times that of stem cuttings, and 3.6 times that of root cuttings). Commercial plantations for root production are therefore best raised from seed. [Cf. F.A. 19 No. 1692.]

**232.322. Preparation and Treatment of Soil, including Maintenance of Fertility**

See also Nos. 1484-5, 1863, 1927.

1652. STOECKELER, J. H. **Annual lupines and other cover crops for the forest nurseries of the Lake States.** *Proc. Soil Sci. Soc. Amer.* 21 (5), 1957 (543-6). 12 refs. O.R.E.

Describes trials with *Lupinus luteus*, *L. albus*, *L. angustifolius* and also vetch, soy bean, serradella and rye as green manure in N.E. Wisconsin and Michigan. *L. luteus* consistently gave the best performance averaging 4392 lb. of oven-dry bulk with a mean N content of 89 lb./acre. Hairy vetch gave greater yields but made slow initial growth, which favoured weeds. Insects, particularly aphids and leaf hoppers, may need controlling.

1653. WHITE, D. P., and LEAF, A. L. **Forest fertilization: a bibliography, with abstracts, on the use of fertilizers and soil amendments in forestry.** *Tech. Publ. N.Y. St. Coll. For.* No. 81, 1957. pp. 305.

Contains titles and abstracts of 700 articles, bulletins etc. on the use of fertilizers in the nursery, in the forest, and in plantations. A very brief, partial index under a dozen main headings is appended. The abstracts are largely taken from *Forestry Abstracts* and *Biological Abstracts*.

1654. SANDVIK, M. Gjødsling av granplanter (*Picea abies*) i Sønsterud planteskole. [Fertilizer treatment of *P. abies* in the Sønsterud nursery.] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (499-528). 10 refs. [Nor.nor.e.]

The growth of plants in old cultivated soil in continuous use for 15 years at Sønsterud, has deteriorated progressively. Addition of  $\text{Ca}(\text{NO}_3)_2$  at rates of up to 50 kg./dekare had little or no beneficial effect. Application of 100-400 kg./dekare of  $\text{NH}_4\text{NO}_3$  mixed with chalk (20% N), after covering the soil with fresh or composted sawdust, led to a pronounced increase in growth, as measured by dry weight of plants. Treatment with 40% potash immediately before transplanting caused a chlorotic appearance in plants and a reduction in growth, but application of  $\text{K}_2\text{SO}_4$  slightly increased growth. Growth was not improved by the addition, at a rate of 50 cu.m./dekare, of peaty soil that had been mixed with lime and left for 5-10 years. Mixing sawdust with the soil caused a significant reduction in growth unless extra-large amounts of N were added along with it. Fresh and composted sawdust added as a top dressing after transplanting, considerably reduced the number of weeds. Dry-matter production of 2 + 0 seedlings grown on forest land on pure mineral soil was as much as 5 times that on old nursery soil and twice that in pure needle litter. Recommendations for treating old nursery soil are: use of  $(\text{NH}_4)_2\text{SO}_4$  rather than  $\text{Ca}(\text{NO}_3)_2$  as a source of N; addition of all N fertilizers as top dressings; avoidance of all fertilizers containing Cl; adding any peaty soil or compost unmixed with Ca. The advantages of establishing nurseries on lightly cultivated forest soil, poor in nutrients, are discussed.

1655. GÜNTHER, H. Die Verwendung von 'Glückauf'-Volldünger zur Erziehung von Pappelpflanzen. [The use of the 'Glückauf' complete

fertilizer in growing Poplars.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (12-5). [G.]

When this fertilizer, containing 10% N, 7%  $\text{P}_2\text{O}_5$ , 20%  $\text{K}_2\text{O}$ , 17%  $\text{MgSO}_4$ , 10%  $\text{CaO}$ , and trace elements, was tried on 1-year Poplar plants on a rather poor, neutral sandy loam at 300, 600 and 900 kg./ha., second-year height growth exceeded controls by 36, 69.9 and 81.9% respectively.

1656. [Application of fertilizers to Poplars.] *Korte Meded. Bosbouwproefsta., T.N.O., Wageningen* No. 30, 1957 (13-4). [Du.]

A number of field trials have been laid out. In greenhouse tests, root and top growth of cuttings of *Populus* × *robusta* were greatly improved by addition of basic slag to the soil. Superphosphate reduced growth, probably because of acidity, excessive salt concentrations, or both.

1657. MEIDEN, H. A. VAN DER. Reactie van populierenstek op fosfaat (een oriënterende proef). [Reaction of Poplar cuttings to phosphate (a preliminary experiment).] *Ned. Boschb.-Tijdschr.* 29 (10), 1957 (229-42). [Du.due.]

Cuttings of *Populus* × *robusta* were planted in containers, two sides of which were of glass covered by movable sheets of fibreboard to allow a study of root development during the trials. At the end of the study one of the glass walls was replaced by a board set with nails 10 cm. long that held the roots in position for photographing after the container was dismantled. The phosphate was applied in most of the series as basic slag, at rates of 5-30 g. per container; it was (1) mixed with all the soil at different rates, (2) mixed with the top or bottom, or the right or left half of the soil, or (3) applied unmixed (in this series superphosphate was used instead of basic slag in some tests) (a) in bands through the soil or (b) in patches against the glass wall. Even small quantities of basic slag increased shoot and root growth. The effect on the roots could be clearly seen in series (2). Where the phosphate had been applied to the bottom half of the container only, root growth in the upper part was poor, but when it was applied to the top half, root growth was uniformly good and top growth improved. Growth of cuttings given basic slag as in (3a) and (3b) was good and rather poor respectively, but superphosphate applied by either method gave poor growth.

1658. BELTRAM, V. Das Spurenelement Bor. [The trace element boron.] *Allg. Forstzeitschr.* 11 (25/26), 1956 (323). [G.]

Reports instances in which watering with a 0.5% solution of commercial borax promoted flowering and fruiting and protected plants, including forest nursery plants, against frost. In a nursery near Celje, 1-year-old Spruce and Pine seedlings watered 12 days before a late May frost were unharmed, while untreated plants suffered severely. The treated plants grew 5-6 cm. higher in the growing season than the others. [Cf. F.A. 19 No. 1863.]

1659. BARNARD, R. C. Composts for tubing nursery stock. *Malay. Forester* 20 (4), 1957 (201-5).

The Forest Research Institute has for some years



been using for this purpose a compost made up of 4 parts sandy loam, 2 parts cow-dung and 1-2 parts river sand. Cow-dung, however, is expensive, not always available in sufficient quantity, and variable in nutrient content. Experiments with a modified John Innes potting compost (7 parts jungle topsoil, 3 parts weathered peat subsoil, 2 parts river sand with addition of ground limestone) gave as good growth of seedlings as the F.R.I. compost. The process of making the compost is described in detail.

### 232.323. Sowing and Covering

1660. ARNBORG, T. Untersuchungen über die Bodentemperatur in einer mittelschwedischen Baumschule. [Investigations on soil temperature in a nursery in Central Sweden.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (101-5). 16 refs. [G.]

A preliminary report on investigations into the best times for sowing Pine and Spruce in a N. Hälsingland nursery by comparing germination temperatures with soil temperatures at the surface and at depths of 1, 8, and 80 cm. Within the ranges tested, germination % and germinative energy were greatest between 15 and 20° C. At 5-8° only isolated seeds germinated. In the open, seed sown at the end of May and 3 weeks later had reached the same stage of development by October. Fluctuations in soil temperature, particularly near the surface, were reduced by watering, and copious day-time watering on hot days proved beneficial.

### 232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 1894-5.

1661. SCHMIDT, A. Beregnungsanlagen im Forstpflanzgarten. [Overhead irrigation in nurseries.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (122-5). 5 refs. [G.g.]

Discusses the use of sprinkler systems, particularly the advantages of mist sprayers over sprinklers with large droplet sizes. A German system in which the water is atomized by hitting a baffle-plate under pressure of ca. 2 atm. is described. Some technical and performance data are also given.

### 232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See also Nos. 1688-90, 1750.

1662. MULLIN, R. E. Experiments with root and top pruning of White Spruce [*Picea glauca*] nursery stock. *Res. Rep. Ont. Dep. Lds. For.* No. 36, 1957. pp. 31. 28 refs.

As a result of two experiments it is concluded that moderate root pruning (to a depth of 3 in.) combined with cutting back (to a height of 5 in.), carried out on 2 + 1 stock in the transplant beds, should increase its survival when planted out at 2 + 2. The operation also tends to produce stock of a more uniform size for packing.

### 232.327. Protection Measures in Nurseries

See Nos. 1927-8.

### 232.328. Vegetative Propagation

See also Nos. 1392, 1398, 1508.

1663. ZAK, B., and McALPINE, R. G. Rooting of Shortleaf and Slash Pine needle bundles. *Res. Note Stheast. For. Exp. Sta.* No. 112, 1957. pp. 2. 5 refs.

Describes experiments with (a) needle bundles in various stage of development from 1½-year Shortleaf Pine seedlings and (b) fully developed needles of a 2-year rooted Slash Pine cutting, both dipped in 0.8% IAA in talc. Of 492 bundles of (a) only 12 developed any roots, while in (b) (48 needle bundles in all) rooting % varied between 58 and 5 according to method of planting. Of the rooted needle bundles of both species, only one Slash Pine developed a shoot. [Cf. F.A. 17 No. 3887.]

1664. SATOO, S. [Anatomical studies on the rooting of cuttings in coniferous species.] *Bull. Tokyo Univ. For.* No. 51, 1956 (109-58 + 42 plates, 3 tbls.). 69 refs. [Jap.jap.e.e.]

The origin of rooting is illustrated in 244 photographs of tissues and cuttings, data on the material (23 genera, 31 species, 46 races), being tabulated under age of mother tree, type of cutting (including epicotytic), rooting medium, days to first primordia and first roots, number rooted etc., greenhouse conditions and, for 5 species, subsequent rooting. Adventitious roots arose from (a) the cambium or phloem of ray tissues, (b) leaf and branch traces, (c) bud meristem and bud traces, (d) irregular parenchyma associated with callus, (e) callus tissues. The genera studied were (1) *Cryptomeria*, (2) *Thuja*, (3) *Chamaecyparis*, (4) *Ginkgo*, (5) *Cephalotaxus*, (6) *Podocarpus*, (7) *Taxus*, (8) *Torreya*, (9) *Pinus*, (10) *Sciadopitys*, (11) *Larix*, (12) *Abies*, (13) *Tsuga*, (14) *Picea*, (15) *Thuja*, (16) *Cunninghamia*, (17) *Juniperus*, (18) *Cedrus*, (19) *Cupressus*, (20) *Sequoia*, (21) *Taxodium*, (22) *Taiwania*, and (23) *Metasequoia*. Almost all adventitious roots from stem tissues at the cut bases arose in (a) and developed in conjunction with adjacent meristematic phloem and cambium. Primary tissues generally played a greater role than secondary, e.g. in (1) and (2). Abnormal uniseriate and multiseriate rays were prominent in (a) root formation (1-3, 15, 19). Leaf-trace origins (b) were exemplified in (2) and (14), branch-trace origins only in (10), bud origins (c) in (9) and (11). Callus-tissue origins (e) play an important part in the rooting of conifer cuttings, especially in the so-called difficult species e.g. (9, 12, 14). In these almost all adventitious roots arise from (e) and (d).

1665. ABE, M., IMAI, M., and SHIMADA, K. [Experimental planting of cuttings from [40- to 42-year-] old *Cryptomeria japonica* in electrically heated beds.] *J. Jap. For. Soc.* 39 (6), 1957 (245-8). 14 refs. [Jap.]

Cuttings 30-45 cm. long from mid-crown branches up to 5 years old were raised in sheltered, electrically heated beds, maintained roughly at 20, 25, 30 and 35° C. from June 8 to July 31. Numbers rooting at the higher temperatures were not significantly greater than in unheated controls, but preliminary

dipping in 0.1%  $\text{KMnO}_4$  (12 hours) and then 0.01%  $\alpha$ -NAA generally increased the number of takes. Results are tabulated in detail.

1666. WOODS, J. J. **Holly propagation under Mazda lights.** *Abstr. in Agricultural Institute Review, Ottawa* 12 (3), 1957 (40). O.R.E.

At different dates from October to March, cuttings of *Ilex aquifolium* stuck into shallow boxes filled with sand, were placed in a propagation box (a 3-ft. cube) in a dark basement. The box was heated and lighted continuously by a 60- or 100-watt Mazda lamp, maintaining temperature at 60° or 70° F. respectively. Rooting was 63 to 100%, a high % having struck after 45 days. All rooted cuttings later made satisfactory growth.

1667. COGGESHALL, R. G. **Asiatic Maples: their propagation from softwood cuttings.** *Trees Mag. Ohio* 17 (6), 1957 (6-9, 20).

Gives data on 14 species.

1668. WALTER, and PIESNACK. Untersuchungen über verschiedenes Setzen der Pappelstecklinge. [Testing different ways of planting Poplar cuttings.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (15-6). [G.]

Plants grown from cuttings buried vertically in the soil so that the top was covered with 1 to 2 cm. of soil exceeded in survival %, height, weight of foliage and diameter growth those planted with the top bud protruding 1 to 2 cm. above ground.

1669. PAGONY, H. A nyárdugványok álgesztesedése III. [The development of false heart in Poplar cuttings. III.] *Erdömérn. Föisk. Közl.* 1956 (2), (103-17). 6 refs. [Hu.hu.russ.e.]

[Cf. F.A. 18 No. 3993.] Cuttings of *Populus × marilandica*, some previously stored in sand, some fresh cut, were soaked for 12 and 24 hours in a 0.0005% solution of 2,4,-D, and examined one and two seasons after planting. The treated cuttings were no better than the controls in stem and root growth or callus formation, and they had more false heart. Fresh cuttings were no better than stored cuttings in stem and root growth, but had less false heart and the occlusion of both apical and basal cut surfaces was essentially better. Cuttings with terminal buds, and root cuttings, rooted very badly.

1670. THÜMMLER, K. Untersuchungen zur vegetativen Vermehrung von *Populus tremula* L. durch Grünstecklinge mit Hilfe synthetischer Wachstumsstoffe. [The propagation of *P. tremula* by soft cuttings with the help of growth regulators.] *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (Beitr. Pappelforsch. No. 2), 1957 (179-203 + 2 tbls.). 17 refs. [G.g.]

In the main test series, soft cuttings from 1- and 2-year-old plants of different parentage, collected in June or early July, were planted in cold or hot beds at Graupa. Only in the hot beds, and then only if growth regulators were used, were satisfactory results obtained. Early cuttings did best. With Belvitan applied in medium doses (submersion for 24 hours in 0.25-1.25 g./litre water) up to 100%

rooting was obtained for some clones (mean 72% for cuttings). Indole-3-butyric acid, alone or in combination with indole-3-acetic acid and/or K  $\alpha$ -naphthyl acetate, was more successful than the two last named alone, as regards both rooting % and root development. No clear conclusions as to dosage emerged. Individual differences between clones were great, particularly in a preliminary test series with cuttings taken from forced branches in March and April and planted in the hothouse. With some of the material from older trees, 76% rooting was obtained without growth regulators.

1671. TYCE, G. M. **Growth substances in relation to the rooting of *Salix fragilis* cuttings.** *Ann. Bot.* 21 (83), 1957 (499-512). 22 refs. O.R.E.

The rooting responses of cuttings taken monthly from Oct. to June were compared with the content of growth-promoting substances in the extracts prepared from them. Rooting responses were low from Oct. to Dec., and high from Jan., to a maximum in June. Current year's growth, tested from June to Oct., had weak responses. Though growth-promoting content was likewise low in early dormancy and higher in late dormancy and during summer, no exact correlation could be found. Extracts from cuttings taken in dormancy strongly inhibited the action of IAA on *Avena* coleoptile segments, this effect being less in extracts from the later dormancy period and summer. The inhibitory action was reduced if cuttings had been left in water to root before extraction, suggesting a leaching out of inhibitory substances. A beginning was made of a separation by chromatography, of the growth-promoting and growth-inhibitory substances. *From author's summary.*

1672. OOYAMA, N. [Substance to inhibit rooting which is contained in branches of Yamamomo (*Myrica rubra*) and methods to improve rooting of cuttings.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 99, 1957 (145-70 + 8 photos). 21 refs. [Jap.jap.e.e.]

Eliminates osmotic pressure and pH as causes, and demonstrates the presence in older material of an inhibitory substance, the effect of which is removed by treating with a 0.05% solution of  $\text{AgNO}_3$  and then with a 0.01% solution of Na  $\alpha$ -naphthalene acetate. Cuttings are best collected in April-May (before bud burst) or July-August (when growth is quiescent) from current wood of 7-year-old trees. Such summer cuttings gave 70% rooting without treatment.

1673. VAŠKULAT, P. N. Povyšenie regenerativnoj sposobnosti rastenija pri povtornom vegetativnom razmnoženii. [An increase in the regenerative capacity of plants after repeated vegetative propagation.] *Agrobiologija* 1957 (2), (117-20). 11 refs. [Russ.] I.M.I.

Root cuttings were taken (a) in 1953 from 12- to 14-year seedlings of *Phellodendron amurense*, (b) in 1954 from the plants so obtained, and (c) in 1955 from this second generation of vegetatively propagated plants. The % of rooted cuttings was 45-56 for (a), 80-82 for (b) and 89% for (c). Root cuttings taken in 1955 from one- and two-year



seedlings gave strikes of 78 and 62% respectively. Experiments with stem cuttings also showed that the % strike increased from 3 for cuttings from 12-year plants of seedling origin to 37 and 41% respectively for cuttings from vegetatively propagated plants of the 1st and 2nd generations.

1674. PARTOS, G. A fehér és a szürkenyár vegetatív szaporítása. [The vegetative propagation of White and Grey Poplars.] *Erdész. Kutatás., Budapest* 1956 (4), (167-73). 4 refs. [Hu.russ.e.g.]

Describes a method of layering from rooted saplings of *P. alba* and *P. canescens*, species not amenable to reproduction from cuttings. The saplings, planted at 2 × 2 m., are cut back to two basal lateral shoots when these are nearly 2 m. long. These shoots are then layered in shallow trenches along the sapling line and covered with heaped soil. By treating alternate saplings, there is space for the 2 trenches in the 4-m. interval between alternate plants. Next year the latter are similarly treated and so on annually for continuous production. [Cf. *F.A.* 16 No. 2929.]

1675. FRÖHLICH, H. J. Die autovegetative Vermehrung durch Luftablegerverfahren. [Vegetative propagation by air-layering.] *Silvae Genet.* 6 (5), 1957 (143-7). 7 refs. [G.g.e.f.]

A method of air-layering is described in which highly concentrated growth substances and plastic film are used. Nearly all broadleaved trees showed good results if the cuttings were hardened off in a bed with automatic overhead irrigation, regulated to maintain suitable r.h. and soil moisture. Protection from wind is ensured by plastic side-screens. With conifers the rooting % was lower. Tables show the best methods for 16 broadleaved and 9 coniferous species. *From author's summary.*

1676. PHILIPPE, J. Essais de reproduction végétative du 'nsafu' *Dacryodes (Pachylobus) edulis*. [Vegetative propagation of *D. edulis*.] *Bull. Inform. Inst. nat. Étude Agron. Congo belge* 6 (5), 1957 (319-27). [F.]

This Mango-like tree, which attains 24 m. in the forest and is widely cultivated for its fruits, can be propagated by air-layering. Seven other vegetative methods failed. A band of bark, 0.5-2.5 cm. wide, is removed from a branch of 1.5-3 cm. diam. in late October, and the band girdle left exposed for a few days to dry. It is then covered with a thick layer of earth, protected by some resistant covering. In practice, a 2-litre tin split down one side to the middle of the bottom, has been found the simplest and cheapest covering. The earth is well rammed down and kept moist, and the tin is supported by wires attached to main branches. At the end of a year, the marcottes are severed from the parent tree and planted out. In an experiment with 100 marcottes, 32 rooted and, of these, 75% survived when planted out.

1677. GIORDANO, E. Osservazioni preliminari sulla moltiplicazione vegetativa negli eucalitti. [Preliminary observations on the vegetative propagation of Eucalypts.] *Pubbl. Cent. Sper. agric. for.,*

*Roma* 1, 1956 (1957), (97-107 + 4 photos). 27 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

Attempts to propagate cuttings in the greenhouse were unsuccessful. Layering, carried out in August on 52 two-year-old specimens of *E. resinifera* gave 57% success. Experiments were made in the autumn to find a satisfactory grafting technique. Approach grafts all failed, but 40% of single-cleft grafts were successful. Further experiments were carried out in the greenhouse in March, 66 full-cleft grafts being made of *E. resinifera* on to *E. × trabuttii* raised in pots. The material was about one year old, grafts took 20 days, and 74% succeeded. Dormant-bud grafts in August, using the same species, all failed. It is concluded that layering deserves to be tried on a large scale. Full-cleft grafting at the beginning of the growing season appears to be a particularly suitable method; for success, the scion must be protected in order to reduce transpiration.

1678. SCHRÖCK, O., and HOFFMANN, K. Sommerpropfungen im Freiland für die Anlage von Samenplantagen. [Summer grafting in the open for establishing seed orchards.] *Züchter* 27 (5), 1957 (246-50). 8 refs. [G.g.] E.M.B.

Experiments were carried out in 1953-54, using different grafting methods. Results showed that Pine and Spruce could be grafted in July and August with greater success than in spring. Grafting should be done on dry days, but high air humidity immediately before or after, and a high maximum temperature, improve the results. Grafts with Douglas Fir gave similarly good results. Preliminary results from Larch, Beech and Elm were promising.

1679. Pine propagation. *Rep. Tenn. Vall. Auth.* 1956/57, 1957 (17-8).

In a first trial of budding, buds at the base of needle clusters were first forced into growth by cutting off branch terminals. The forced buds were then transferred by patch and chip budding methods. One month after the first trials in May, 65% of *Pinus taeda* and 40% of *P. echinata* buds had put out shoots, some as much as 3 in. long.

1680. ROMBERG, L. D. Use of polyethylene bags for covering bark grafts. *Report, Northern Nut Growers Association, New Haven, Conn.* 1956, No. 47, 1956 (71-3). E.M.B.

Describes the successful use of such bags, which have many advantages over the wax generally used to protect grafts: they provide uniformly favourable conditions for callus formation, protect the wound against borers, and eliminate the difficulty of melting wax in the field.

#### 232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 1659.

1681. MERLI, L. Ricerche sul trapianto degli eucalitti. (Nota preliminare.) [Investigations on transplanting of Eucalypts. (Preliminary notes.)] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957),

(153-8 + 8 photos). 4 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

Comparison of seedlings raised in seedbeds and in pots has shown that the latter are easier and quicker to transplant, easier to protect (especially against the mole cricket), and root better (75% take compared with 52%).

### 232.33. Formation of Stands by Direct Sowing

See also Nos. 1505, 1688.

1682. KRAEVOJ, S. JA. Novye dannye o konkurentnyh vzaimootnošenijah v rastitel'nyh sobščestvah. [More data on competition in plant communities.] *Dokl. Akad. Nauk SSSR* 115 (3), 1957 (619-22). 11 refs. [Russ.] A.P.B.

From a visual examination of 4-year-old Oak seedlings sown by the nest method at an experiment station in the Ergeni Hills, plants in the central seed-spots appeared to be suppressed by those in the outer seed-spots. The nests, each containing 5 seed-spots, were spaced 3 m. apart in rows with 6-m. interspaces carrying agricultural crops. Data were collected on seedling height, number and dry weight of leaves per plant, and leaf length, for plants in ca. 100 seed-spots each in central and marginal positions. Differences were found to be statistically significant, confirming that, as a result of intra-specific competition, the seedlings in the central seed-spots were being suppressed. Line or line/seed-spot methods of sowing are recommended.

1683. OL'ŠANSKIJ, M. A., ZEL'MAN, D. P., and ŽELEZNOV, G. F. Dostizhenija v teorii i praktike polezaščitnogo lesorazvedenija (vos'miletnie itogi gnezdovogo poseva duba v opytnyh učreždenijah). [Achievements in the theory and practice of shelterbelt establishment (results after 8 years of the nest sowing of Oak at experiment stations).] *Agrobiologija* 106 (4), 1957 (79-108). [Russ.] I.M.I.

Data are given on the total area sown by the nest method, and the number of seedlings per nest, the lowest, highest and average values for height and diam., and increment for the 8 years after sowing, for 65 experiment stations. Results, and the influence of cover crops on seedling growth, are discussed. The authors consider the nest method to be fully justified.

1684. STEIN, W. I. A successful direct seeding of Sugar Pine. *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 25, 1957. pp. 19. 1 ref.

In 1952 a 45-acre clear-cut tract of forest land in S.W. Oregon was spot-sown at 4 × 8-ft. spacing with Sugar Pine at 1-2 seeds per spot. Seed-eating rodents were controlled earlier by poison bait. After 2 years, germination was satisfactory but significantly better in areas where spots had 2 seeds each (74.5%) than when sown alternately with 1 and 2 seeds (56.2%). Seedling mortality, caused mainly by insects and rodents, averaged 34%. Recommendations for direct sowing of Sugar Pine are made—type of seedbed, stratification of seed, spacing and number per spot. It is concluded that successful regeneration of Sugar Pine can be obtained by direct sowing if the seed is adequately protected from rodents.

1685. KVERNO, N. B., and HARTWELL, H. D. *Pacific Northwest 1955-56 and 1956-57 experimental seeding studies. Progress Report.* Fish and Wildlife Service, U.S. Department of the Interior, Washington. 1957. pp. 50.

[Cf. F.A. 17 No. 580.] More than 70,000 acres of unproductive forest land were sown with treated seed in western Washington and Oregon in the 1956-57 season. Experiments during the past two years have been concerned with: (1) the effectiveness of endrin treatment of Douglas Fir seed in repelling small rodents; (2) improving the effectiveness of endrin by adding adhesives and fungicides; (3) the possibility of protecting natural seed-fall with treated seed; (4) rodent damage to young seedlings; (5) seedbed conditions; and (6) the survival of direct-sown seedlings. The experiments fully confirmed (1); in one case 15,200 seedlings/acre were produced from endrin-treated seed, compared with 3150 from untreated. (2) The field experiments were not sensitive enough to yield definite results, but there were indications that the inclusion of the Cu salt of Omadine gave additional protection. (3) Experiments indicated that rodents distinguished between treated and untreated seed, rejecting the first and eating the second. (4) It was found that rodents were responsible for most of the loss of seedlings, which in one case amounted to 2452 seedlings/acre in a 6-week period. (5) The importance of a good seedbed was demonstrated on two plots, one cleared of slash and duff before sowing and the other left intact, the resulting catch of seedlings being 2452 and 333/acre respectively. (6) Examination of several 4- to 5-year-old seedling experiments showed excellent stocking, survival and growth on some areas, whereas deer and rabbits limit growth and reduce survival on others. *From authors' summary.*

1686. DICK, J., and LAWRENCE, W. H. *Protective seeding with tetramine-coated Douglas-Fir seed.* *For. Res. Note Weyerhaeuser Timber Co.* August, 1957. pp. 10. 5 refs.

In order to test the theory that natural seeding could be protected from rodents by presenting them with a light artificial seeding of tetramine-treated seed to produce an aversion before natural seed-fall, an experiment was carried out in 1956, when the heaviest Douglas-Fir cone crop of recent years occurred. Results indicated no rodent aversion, but further experiment is desirable. [Cf. F.A. 16 No. 1942.]

### 232.4. Formation of Stands by Planting

See also No. 2180.

1687. BASTOS, A. DE MIRANDA. Madeiras para a indústria do papel. [Wood for the pulp industry.] *An. bras. Econ. flor., Inst. nac. Pinho* No. 9, 1957 (256-62). [Port.]

Presents information on *Araucaria angustifolia* plantations established in Monte Alegre by the Indústrias Klabin do Paraná de Celulose. Seedlings of this species have been successfully transplanted to open sites.

1688. MOULOPOULOS, CH., and MPASIOTIS [BAS-SIOTIS], K. Synkrisis methodōn technētēs hidryseōs



dasosystadön. [A comparison of methods of artificial reforestation.] *Epistēmōnikē Epetēris, Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* No. 3, 1955/1956 (365–94). 18 refs. [Gk.e.e.]

A statistically based study, laid out in 10 sites of the evergreen broadleaved-sclerophyll zone near Thessalonika (19–20 in. rainfall), and supported by observations on June–Nov. soil moisture in the field and on the wilting point for potted seedlings. The variants included early and late autumn planting of 2- and 8-month seedlings, root-pruned or not, and direct sowing, of *Pinus halepensis*, *P. h.* var. *brutia* and *P. pinea*. For these sites the planting of 8- to 12-month seedlings (shoots 15–20 cm. and root-pruned to 20 cm. by undercutting ca. 3 weeks before lifting) is recommended for the first two Pines, and direct sowing for the last. On moister sites than those studied, direct sowing in strips and terraces may be recommended for all three species.

1689. MPASIOTĒS [BASSIOTIS], K. Epidrasis tēs proparaskeuastikēs rizokopēs epī tēs epibiōseōs tōn phytariōn tēs tracheias peukēs. [Influence of root-pruning on the survival of *Pinus halepensis* var. *brutia* seedlings.] *Epistēmōnikē Epetēris, Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* No. 3, 1955/1956 (395–414). 7 refs. [Gk.e.e.]

In sites of the dry and hot evergreen broadleaved-sclerophyll zone near Thessalonika, seedlings root-pruned by undercutting 8–10 in. below soil level, some weeks before lifting, and planted in autumn, showed in the following autumn significantly better survival and height than unpruned ones. To attain the same eventual density as that given by 100 root-pruned seedlings per unit area, would require respectively 154, 196 and 219 unpruned ones on the three plots studied, the superiority of the root-pruned stock increasing with the adverseness of the site.

1690. MPASIOTĒS [BASSIOTIS], K. Ho katallēlos chronos phyteuseōs paramesogeion tinōn xērothermobiōn kōnophorōn. [The proper planting time of some of the Mediterranean conifers.] *Epistēmōnikē Epetēris, Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* No. 3, 1955/1956 (415–56). 23 refs. [Gk.e.e.]

Large losses in the first few weeks, and even more in the following summer, among planted *Pinus halepensis*, *P. h.* var. *brutia*, *P. pinea* and *Cupressus sempervirens* in the evergreen broadleaved-sclerophyll zone near Thessalonika are ascribed to the inability of the plants used to regenerate, in the time and at the soil temperatures prevailing, a root system capable of absorbing enough water. A 4-year study shows that new roots are formed in 22–25 days with mean daily root-zone temperatures of 15–25° C., and in 70–100 days at 6–10°. Favourable temperatures prevail in October, part of November, and April. Conditions are less favourable in the winter months, and root growth ceases at 2–5°. Autumn rains moistened the top 15 in. of the soil from the second fortnight of Oct., from which time until the second fortnight in March all seedlings ceased top growth, except *P. halepensis* which was dormant from the end of Oct. to the first fortnight

in March. A replicated trial of *P. h.* var. *brutia*, planted on 4 sites, using (a) root-pruned and (b) unpruned seedlings, on 10 Oct., 1 Nov., 1 Dec. and 15 Feb., showed significantly better survival a year later for (a), planted in Oct.–Nov., than for the other treatments.

#### 232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 1640–1, 1688–90, 2606.

1691. KNIGHT, H. Growth and survival of experimental plantations of Douglas Fir [in *British Columbia*]. *Res. Note B.C. For. Serv.* No. 33, 1957. pp. 22. 3 refs.

Gives data on survival and initial growth from 5 experimental plantations, using 2 + 0 planting stock. Seedling type and size, nursery, site, fertilizers, and seed source had little influence on survival, but seedling size, nursery and site considerably influenced initial growth. There was some indication that 6–10 in. would be a reasonable size for Douglas Fir planting stock and that 4 in. is definitely too small.

1692. BADHWAR, R. L., et al. *Rauwolfia serpentina*: methods of propagation and their effect on production and alkaloidal content of roots. *Indian For. Leaflet*. No. 148, 1956 (1957). pp. 7 + 3 photos.

Yield of roots in 1-year plants is about 6½ times as great from seedlings as from plants grown from stem or root cuttings. [Cf. *F.A.* 19 No. 1651.]

1693. NIELSEN, C. N. Revision af forsøg med rødgranplantning efter forskellige metoder. [Review of a study on planting Norway Spruce by different planting methods.] *Dansk Skovforen. Tidsskr.* 42 (5), 1957 (257–80). 9 refs. [Dan.] (*Kort Meddelelse fra Statens Forstlige Forsøgsvæsen* No. 26.)

Plots were laid out in 1935–36 in 8 districts, using 2 + 0 or 2 + 2 plants and different planting methods. By 1955, only 3 plots from 2 districts, viz. Rold forest (R) 1936, Buderupholm district, and Pamhule forest (P) 1935–36, Haderslev district, were suitable for inclusion in the review, being intact and not too much affected by neighbouring stands. At R and P 1935, 2 + 2 plants gave better results than 2 + 0 and although, at P 1936, 2 + 0 plants at the time of the review were only 2 years behind the 2 + 2 ones, the saving in cost by using smaller plants would not outweigh their 2-year lag in development at the end of the rotation. At P, planting 2 + 0 plants in T-notches gave rather better results than the other planting methods, but the reverse was true at R. Differences with 2 + 2 plants at R and P were not statistically certain, but it appeared that at P the two cheaper methods, planting in T-notches or in holes made by mattock, gave results equal to those for planting in holes dug by spade.

#### 232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 1589, 1622–3, 1653, 1693, 1722, 1788, 1994.

1694. MALAC, B. F., and JOHNSON, J. W. Deep planting increases survival of Slash Pine on sandy site.

Woodl. Res. Note Union Bag. Pap. Corp., Savannah No. 5, 1957. pp. 2.

Experiments in planting *Pinus elliottii* var. *elliottii* (1) at normal depth, (2) to a depth halfway between (1) and terminal bud, and (3) to 1 in. below terminal bud, confirmed previous findings that deeper planting increases survival, especially on dry, sandy soils.

### 232.43. Spacing and Arrangement in Plantations

See also Nos. 1730, 2486.

1695. CROMER, D. A. N., and PAWSEY, C. K. Initial spacing and growth of *Pinus radiata*. Bull. For. Timb. Bur. Aust. No. 36, 1957. pp. 42. 14 refs.

A bulletin giving detailed statistical analysis of experiments already reported more briefly [see F.A. 18 Nos. 2805-6].

1696. HAMILTON, J. R. An evaluation of Southern Pine plantations in the Georgia Piedmont Plateau. Bulletin, Georgia Agricultural Experiment Station, Athens, Ga. (n.s.) No. 20, 1956. pp. 41. 23 refs.

A study was made of 103 plantations scattered through the area, to determine the effect of spacing on growth and development of stands. It was found to have a marked effect on d.b.h., b.a./acre, branch size, live crown ratio, and bark thickness, but not on total height. Spacings recommended are  $4 \times 4$  ft. for *Pinus echinata* and *P. palustris*, and  $6 \times 8$  ft. for *P. taeda* and *P. elliottii*. Though *P. echinata* is not planted to any great extent on the Piedmont Plateau, it should be considered for planting in areas subject to frequent glaze storms owing to its relative immunity to deformation due to glaze damage; *P. elliottii* is very susceptible, *P. taeda* rather less so. All species respond well to good sites and are disappointing when planted on spoil-mounds.

1697. GUIMARÃES, R. FOOT. Ensaios de espaçamentos em *Eucalyptus saligna*, para produção de lenha. [Spacing of *E. saligna* for the production of fuelwood.] An. bras. Econ. flor., Inst. nac. Pinho No. 9, 1957 (144-72). 20 refs. [Port.port.e.]

In experiments in the Horto de Aimorés, using 11 different plantation spacings, the trees were felled at the end of 8 years and the yield in cu.m. of each plot was recorded. Statistical analysis showed that the most profitable spacing, as far as net yield was concerned, allowed each tree an area of 7.6 sq. m. The following distances are recommended when planting *E. saligna* for fuel: (1)  $1.5 \times 3$  m. for absolute net profit; (2)  $2.5 \times 3$  m. for relative net profit, i.e. in relation to the original investment.

### 232.44. Season and Time of Planting

See also Nos. 1688-90, 2606.

1698. OBRADOVIĆ, M. La fin de l'été, saison propice au reboisement dans les régions arides. [Late summer, a favourable season for afforestation in arid regions.] Rev. for. franç. 9 (8/9), 1957 (652-61). [F.]

Describes experiments in afforesting karst regions

in Montenegro with prolonged summer drought [cf. F.A. 17 No. 384]. *Pinus halepensis* planted in Sept. or Oct. do much better than those planted in December (the traditional season), getting an extra 2-3 months' rain in their first growing season.

### 233. Afforestation

See also Nos. 1301, 1322, 1713, 1768, 2579-80.

1699. WESTHUYZEN, J. J. N. VAN DER. Combating sand dunes at Port Edward. Trees and shrubs used in reclamation. Fmg. S. Afr. 33 (7), 1957 (37-9). E.M.B.

Recommendations for the fixation of sand dunes (probably the results of overgrazing) at Port Edward on the south coast of S. Africa include the control of livestock and the planting of at least 3 zigzag rows of *Casuarina equisetifolia*, 4-6 ft. apart, and some 30-50 yards to windward; also planting the shrubs *Osteospermum* sp., *Brachylaena discolor* and *Stoebe vulgaris* along the base of the dunes, and *Pinus pinaster*, *Acacia cyanophylla* and *A. cyclops* with the grass *Digitaria sanguinalis* on their flanks.

1700. POUPON, J. Une expérience de fixation des dunes dans l'extrême-sud de Madagascar. [An experiment in dune fixation in the extreme south of Madagascar.] Bois For. Trop. No. 55, 1957 (9-19). [F.]

The method used involved 3 stages: (1) creation of lines of wattle for mechanical fixation, (2) sowing and planting of herbaceous and shrub species, (3) establishment of tree species. Tabulated information is given on species used in stages (2) and (3).

1701. AGOSTINI, R. Interpretazione della vegetazione su basi fitosociologiche nel campo applicativo forestale. [Practical applications of ecological analysis of vegetation to forestry purposes.] Ital. for. mont. 12 (5), 1957 (205-13 + 2 tbls.). [It.it.f.]

Illustrates the value of ecological studies as a preliminary to afforestation by two examples of planting recently carried out (on coastal dunes in the Paestum region and on calcareous soils in the Tanagra basin) where analysis of the existing vegetation would have indicated a different choice of species to that actually made.

1702. SZÖNYI, L. Termőhelyfeltárás a Kiskunhalasi homokfásítások területén. [Site investigations in the afforestation area of Kiskunhalas.] Erdész. Kutatás., Budapest 1956 (4), (99-119). 3 refs. [Hu.russ.g.]

Gives details of the basis and time taken for a survey of 10,000 ha. on the lines explained in F.A. 19 No. 1301. Proposed species are *Populus canescens*, *Pinus sylvestris*, *P. nigra* var. *austriaca* and on the best soils *Robinia pseudoacacia*, *Quercus robur*, and *Alnus glutinosa*.

1703. SZÖNYI, L. Az exoták szerepe a magyar homokfásításban. [The role of introduced species in the afforestation of sand areas in Hungary.] Erdész. Kutatás., Budapest 1957 (1/2), (49-64). [Hu.russ.e.g.]

Among the natural tree growth of these areas, the establishment of stands of Robinia, Scots and Austrian Pine, and, as an understorey to Poplar,



*Celtis australis*, should be considered. For single-stem and group mixtures the *viridis*, *caesia* and *glauca* varieties of Douglas Fir, *Pinus jeffreyi*, the valuable Poplars, some *Salix* species, *Platanus orientalis*, *Gleditsia triacanthos*, *Elaeagnus angustifolia*, *Maclura pomifera*, *Juniperus virginiana* and *Prunus serotina*, promise good results. At the leeward base of the dunes, Scots Pine with a well developed understorey of *Prunus serotina* is a dominant feature. On the driest slopes a mixture of Scots Pine and Robinia is the only possibility. The leeward slopes generally carry natural tree clumps and in the most favourable sites here all the species mentioned may be planted.

1704. WAENINK, A. W. Stuifzandgronden en hun bosbouwkundige waarde. [Blown sand sites and their silvicultural value.] *Tijdschrift der Nederlandsche Heidemaatschappij*, Arnhem 67 (7/8), 1956 (174-8). [Du.] C.G.B.

These sites in the Netherlands vary considerably in humus content, depth of blown sand, and nature of the soil below. The humus content is the factor most affecting growth. Examination of young plantations showed little difference in growth between Scots, Austrian and Corsican Pines. Douglas Fir does considerably better than Scots Pine, even on sites of moderate quality. Larch can be expected to do well on the best blown-sand sites, but should not be planted on the poorer ones.

1705. BEUNIS, P. C. De bebossing van mijnsteenstorten in Zuid-Limburg. [Afforestation of mine spoil-mounds in S. Limburg.] *Tijdschrift der Nederlandsche Heidemaatschappij*, Arnhem 67 (7/8), 1956 (179-87). [Du.] C.G.B.

Several coalmine spoil-mounds have been successfully planted. Successful tree species are *Quercus robur*, *Q. borealis* var. *maxima*, *Robinia pseudoacacia*, *Betula verrucosa*, *Alnus glutinosa*, *A. incana*, *Populus* spp., *Prunus padus*, *Salix caprea* and *Larix leptolepis*. *Prunus avium*, *P. serotina*, *Acer pseudo-platanus*, *A. platanoides*, *Carpinus betulus*, *Castanea sativa*, *Crataegus monogyna*, *Salix alba*, and *Pinus nigra* var. *austriaca* have grown fairly well, but the prospects of *Fagus sylvatica*, *Fraxinus excelsior*, *Sambucus nigra*, *S. racemosa*, *Pseudotsuga taxifolia* and *Pinus sylvestris* are doubtful. Birch, Aspen, *R. pseudoacacia*, Alder and *Salix caprea* are suitable for pioneer planting on the S. and N. slopes exposed to sun and wind, and *Acer* spp., *Carpinus betulus*, *Salix alba*, Norway Spruce, and even Beech and Ash, do well on the shaded, moister N. and E. slopes. Species resistant to fumes, that can be used within 1 km. N.E. of existing mines, include Japanese Larch, Norway Spruce, *Picea pungens*, Plane, *Quercus borealis*, Elm, Horse Chestnut, Hawthorn, Poplars and Willows. *Robinia pseudoacacia*, *Quercus robur*, Beech, *Carpinus betulus*, Sweet Chestnut, *Prunus avium*, Lime, Sycamore and Norway Maples, and Douglas Fir are severely damaged on such sites. Planting and tending costs are as a rule no higher than for afforestation on the better forest soils of S. Limburg. Recommendations for site preparation and planting are given.

1706. MITCHELL, B. A. Malayan tin tailings—prospects of rehabilitation. *Malay. Forester* 20 (4), 1957 (181-6 + 8 photos).

Describes the conditions to be dealt with and research into possible methods of rehabilitation and afforestation, as well as improved methods of dumping tin tailings. Species trials (the oldest only 3 years old) show that on very infertile tailings the following are promising: (1) *Acacia auriculaeformis*, (2) *Eucalyptus deglupta*, (3) *Fagraea fragrans*, (4) *Pinus merkusii*; and the following may also be suitable: (5) *Pinus caribaea*, (6) *Casuarina equisetifolia*. Of these, only (3) and (6) are indigenous to Malaya. On mixed shallow slime and sand with a water-table continuously within 1 ft. of the surface, the following show promise: (7) *Albizia falcata*, (8) *Fagraea crenulata*, and (9) *Melaleuca leucadendron*.

1707. MORISHITA, Y., and OYAMA, N. [Early restoration of bare mountains by promoting greening.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 99, 1957 (59-144 + 77 photos). 27 refs. [Jap.e.]

Describes, with many root diagrams and photographs, experience in restoring vegetation to denuded mountain slopes in granite areas along the coast of the Inland Sea. The fast-growing species used were (1) *Acacia dealbata*, (2) *Robinia pseudoacacia*, (3) *Amorpha fruticosa*, (4) *Lespedeza bicolor* var. *japonica*, (5) *Alnus* spp., (6) *Quercus variabilis*, (7) *Populus nigra*, (8) *Pinus thunbergii*, (9) *Salix purpurea* var. *amplexicaulis*, and various grasses. The volume increment at 4 years was best in (1) the others following in the decreasing order (2), (5), (8), (6). Litter production follows a similar order. All such planting requires fertilizers, and recommendations are made for materials (chemicals, *in situ* composting) and application according to mode of regeneration. The optimum density of planting, for cover in 2-3 years is 10,000/ha. and shrubs and grasses should be included. Grading and terracing are generally not recommended. Direct sowing is recommended for (1), (2), (3), (4) and (8) and for grasses, and cuttings for (3), (7) and (9).

1708. GOSWAMI, P. C. Afforestation technique for eroded areas in Damodar catchment. *Indian For.* 83 (11), 1957 (633-40 + 8 photos). 6 refs.

Afforestation of highly eroded areas in the upper Damodar Catchment, Bihar, has been taken up only recently. The Soil Conservation Department of the Damodar Valley Corporation started afforestation work in 1952 and now follows a programme of 1000 acres annually. The paper describes the topography, climate and soil of the region and the techniques followed. Areas for afforestation are selected generally on the basis of land capability and are fenced with barbed wire. Gullies are treated by diverting water from the heads and building check dams. The greater part is afforested with transplants  $\geq 2$  ft. high, in specially prepared pits. Sowing is done only on selected sites, using species that do well with direct sowing. Contour trenching is generally unnecessary, as run-off and sheet erosion are largely controlled by heavy grass growth resulting from closure and fire control; it has not been found effective in increasing growth,

and is done only where vegetative measures alone are not sufficient. Species used are listed. *Shorea robusta* was raised successfully by direct sowing in 1956 and more extensive trials will continue. *From author's summary.*

1709. IYPPU, A. I. Afforestation with Cashews (*Anacardium occidentale*). *Indian For.* 83 (9), 1957 (546-8 + 10 photos).

Describes the use of *A. occidentale* for planting on barren and denuded hills in Kerala State. The best method has been found to be to plant basket-raised stock in pits.

1710. COZZO, D., and HOUTTE, J. VAN. La creación de un núcleo forestal con *Eucalyptus saligna* en Concordia, Entre Ríos, Argentina. [The creation of a forest nucleus with *E. saligna* at Concordia, Entre Ríos, Argentina.] *Rev. for. argent.* 1 (4), 1957 (131-5). [Span.]

Private plantations (aged 1-5 years) round Concordia in the N.E. of Entre Ríos amount to 2600 ha. The afforestation of another 16,000 ha. is projected within the next 7-8 years. Data are presented on the methods used in establishing these plantations and on their development to date.

#### 234. Formation of Forest by Natural Succession

1711. LEISMAN, G. A. A vegetation and soil chronosequence on the Mesabi iron range spoil banks, Minnesota. *Ecol. Monogr.* 27 (3), 1957 (221-45). 34 refs. [Cf. *F.A.* 17 No. 2766.]

#### 235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 1566, 1762.

1712. BURCKHARDT. Erfahrungen mit der orientalischen Buche *Fagus orientalis* Lipsky als Unterbauholzart in Kiefernbeständen. [*F. orientalis* as an understorey in Pine stands.] *Allg. Forstzeitschr.* 11 (18), 1956 (238-9). 4 refs. [G.]

Groups and isolated trees of *F. orientalis* planted under Pine 50-60 years ago, on sandy soil in the Rhine plain near Karlsruhe, considerably exceed *F. sylvatica* in height and diameter increment, have better stem form, denser foliage, and leaves that, being less resistant to decay, form better humus. They have withstood early and late frosts and drought.

1713. WEATHERELL, J. The use of nurse species in the afforestation of upland heaths. *Quart. J. For.* 51 (4), 1957 (298-304). 2 refs.

Some early observations on the effects of nurse crops on Sitka Spruce in an experimental area on the upland heaths [of N. Yorkshire] are recorded. It was found that the importance of the nurse crop was due to its capacity to reduce competition from heather, rather than to any sheltering effect. Spruce roots were found to spread under the nurse crop, especially where this was Japanese Larch, when they root in the Larch litter and surface soil, by then free from heather. Some problems of tending the crop so as to give the Spruce room to grow without removing all the nurse species and permitting the

return of the heather are explained, and various patterns for mixing the species less intimately are described. The early indications of these new experiments are given. *From author's summary.*

#### 236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 1731, 1733-4, 1889 *et seq.*, 1930.

1714. STENZEL, E. E. Forstliche Ausgrasgeräte. [Tools for forest weeding.] *Forst u. Jagd* 7 (10), 1957 (471-4). 13 refs. [G.]

Describes types of scythe, sickle etc., and portable and wheeled mechanical tools powered by internal-combustion or electric motors, the latter driven by take-off from the engine of a 2-wheeled tractor. Some data on physical effort involved and on performance are given.

1715. ROUND, J. C. The amateur inventor. *Quart. J. For.* 51 (4), 1957 (305-7 + 3 photos).

The author describes his efforts to bring 300 acres of badly neglected woodland into proper order, and how he invented a machine to be used with a tractor to clean between planting lines. A Ferguson diesel tractor can be driven over trees 3-4 ft. high, without damaging them, while cutter blades cut the weeds on either side.

1716. Effect of different methods of weed control on growth [of Black Wattle]. *Rep. Wattle Res. Inst. S. Afr.* 1956/57, 1957 (13-4).

Tabulates costs per acre, in labour units and implement hours, for 3 hoeings; 3, 5 and 7 disk cultivations; and 5 mowings, done in the first 2 years, during which no significant differences in Wattle growth appeared. The mowings cost least (25s./acre) and did less damage than disking (31.5s./acre for 3 cultivations), and required no subsequent hand weeding.

1717. MILEWSKI, J. Uprawa i pielęgnacja gleby pod plantacjami topolowymi. [Cultivation and tending of soil under Poplar plantations.] *Las Polski* 31 (15/16), 1957 (3-5). [Pol.]

Describes 4 methods of soil cultivation and tending: (1) clean fallow; (2) clean fallow alternating with cover crops, such as lupin, vetch, mustard, buckwheat, sunflower; (3) cultivation of commercial crops between the rows or even under the canopy; and (4) formation of forest soil cover, i.e. clean fallow is maintained for 1 year after planting, followed by 2 years of (2), while in the fourth year the weeds are allowed to form a mat which is mown 3-4 times a year, and the mowings spread under the Poplar stems to a width slightly greater than the crown projection.

1718. DOMMEN, M. E. An exercise in forest sampling by milliacre quadrats. *Inform. Bull. Dep. For. Res. Nigeria* No. 43, 1957. pp. 9.

Compares sampling rates of 10, 2, 1, and 0.5% of the area, under 2 conditions, viz. counting (a) one selected tree, (b) all trees, on each quadrat. Results are given for 4 size-classes, separately for *Khaya ivorensis*, other commercial species, and *Terminalia superba*. The forest was in the 4th year



of tropical shelterwood treatment with the 2nd climber cutting and poisoning and the 4th cleaning completed.

### 237. Amelioration of Forest Sites

See also Nos. 1473, 1653, 1655-6, 1869-70, 1994, 2005.

1719. FRANZ, H. Die Walddüngung im Lichte der Bodenbiologie. [Forest fertilizing in the light of soil biology.] *Allg. Forstzeitschr.* 11 (25/26), 1956 (321-3). [G.g.]

Discusses short-term findings in connexion with S. Württemberg fertilizer trials in Spruce stands and on a reforestation site. While P, Ca and N combined led to a conversion of raw humus into valuable coprogenous humus by increasing biological activity, and Ca had similar though less rapid results, N alone, particularly as gaseous  $\text{NH}_3$ , caused very great chemical changes but reduced biological activity. With larger doses this amounted to virtual soil sterilization. At the same time considerable leaching of N as  $\text{NH}_4$  and of water-soluble organic substances took place.

1720. FRANZ, H. Die moderne Bodenwirtschaft im Lichte der Bodenbiologie. [Modern soil husbandry in the light of soil biology.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (29-49). [G.]

Includes a discussion of some [unpublished] experiments chiefly on the effect of mineral fertilizers on the biocoenosis of forest and other soils, and their N balance. Treating a raw-humus soil at Dornstetten, Württemberg, with 4000 kg./ha. of Ruhrkorn-Grün [see F.A. 19 No. 1723] resulted in a marked reduction of the  $\text{A}_{00}$  and  $\text{A}_0$  horizons and the total amount of N per ha.  $\text{CaCO}_3$  alone did not reduce the raw-humus layer over the same 3-year period and increased N per ha. This latter effect is interpreted not only as a sign of increased biological activity, but as an indication that fixation of atmospheric N by bacteria in the intestines of soil-inhabiting species had taken place. The first named plot showed the greatest increase in *Lumbricus rubellus* of a series of treatments. Culture tests with soils from other (Württemberg and Austrian) fertilizer trials with  $\text{NH}_3$  gas and/or lime showed, in general, a reduction of fungi and an increase of bacteria, but *Mucor* species had greatly proliferated at  $\text{NH}_3$  injection points.  $\text{NH}_3$  had somewhat reduced the number of oribatids. Other investigations dealt with the effect of mineral and organic fertilizers, flooding, industrial effluents and gases (from magnesite works) on the composition of the soil fauna.

1721. ZÖTTL, H. Untersuchungen über die Stickstoffnachlieferung des Waldbodens. [Experiments on the replenishing of forest soils with nitrogen.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (73-80). 17 refs. [G.]

Describes incubation experiments to elucidate the effect of various fertilizers on the course of  $\text{NH}_3$  and  $\text{NO}_3$  accumulation and, simultaneously, on the  $\text{CO}_2$  production, of samples taken from the bottom of the raw-humus layers of an acid, podzolized, sandy Pine site 1 year after various fertilizer treatments.

No marked differences were found between controls and samples from plots treated with  $(\text{NH}_4)_2\text{SO}_4$  and ammonia water. Samples from plots treated with gaseous  $\text{NH}_3$  still had a considerable amount of available  $\text{NH}_3$ , but  $\text{NH}_3$  accumulation and  $\text{CO}_2$  production were less than in the control, suggesting reduced biological activity—possibly a transitional phase, since earlier research had shown a stimulation immediately after treatment. Samples from plots that had received  $\text{CaCO}_3$ , alone or with other fertilizers, showed little  $\text{NH}_3$  accumulation, but high respiration, suggesting high biological activity. The significance of these experiments for the assessment of N conditions on the site is discussed.

1722. HAUSER, K. Ergebnisse von neueren Forstdüngungsversuchen im württembergischen Schwarzwald. (Vorläufige Mitteilung). [Results of recent fertilizer trials in the Württemberg part of the Black Forest (Preliminary report).] *Allg. Forstzeitschr.* 11 (20), 1956 (261-4). 8 refs. [G.g.]

Reports on trials with N, Ca, P and occasionally K, in various forms, combinations and dosages, laid out 3-5 years ago, mostly on bunter sandstone sites. Broadcasting Ca and P fertilizers on clear-felled areas before planting caused heavy weed growth on the better sites. Plant-hole fertilizing is suggested instead. On poor sites, Ca promoted the growth of Birch, Aspen, etc. which provide frost protection for the main-crop Spruce. No effect of the treatment on height growth was observed, but in somewhat older plantations moderate doses of N aided growth and improved the colour of retarded Spruce, Silver Fir, and Pine. Some scorching was noticed where fertilizer had remained on the foliage. In three 40- to 70-year Spruce stands that had received 400 kg./ha. of Kalkammonsalpeter ( $\text{NH}_4\text{NO}_3 \cdot \text{CaCO}_3$ ) in early spring 3 years running, b.a. and height increment for these years greatly exceeded those of controls.

1723. HUCHLER, Stickstoffdüngungsversuche in Tannenthälern. [N fertilizer trials in mature Silver Fir stands.] *Allg. Forstzeitschr.* 11 (11), 1956 (157-8). 1 ref. [G.]

In small field trials with 125 or 250 kg. N/ha. as Ruhrkorn Grün (containing ca. 10% N as  $\text{NO}_3$ , 10% as  $\text{NH}_3$  and 33-38%  $\text{CaCO}_3$ ) the *Vaccinium* and moss vegetation showed signs of decline, the raw humus became darker and moister, and the few existing Fir seedlings turned from yellow-green to dark-green. In addition, mean cone size and weight, seed content, and seed weight of the fertilized trees increased noticeably over controls.

1724. GOOR, C. P. VAN. Bemesting van fijnspar in heide-bebossingen. [Treating Norway Spruce with fertilizers in heathland plantations.] *Repr. from Stikstof [Netherlands]* No. 14, 1957 (62-8). 4 refs. [Du.]

Fertilizer experiments comprising 4 series and some 24 different combinations of fertilizer were laid out in early spring 1955, in 15-year Spruce, mean height 1.5 m. At the beginning of the experiment, needles were small and yellowish-green. Both colour and size were improved by applications of N and P, and analyses showed a deficiency of N and

P in the needles of plants not given these fertilizers. Height growth in 1956 was increased by all treatments—comparatively little by  $\text{CaCN}_2$ ,  $(\text{NH}_4)_2\text{SO}_4$ , 'calcium ammonium nitrate' [mixed  $\text{NH}_4\text{NO}_3$  and  $\text{CaCO}_3$ , with 20.5% N] and V.A.M. compost [see *F.A.* 14 No. 2201], and more considerably by 'phosphate ammonium nitrate' [mixed  $\text{NH}_4\text{NO}_3$  and  $\text{CaHPO}_4$ , with 20% N and 20% total  $\text{P}_2\text{O}_5$ ], Hoechst Complexal (N, P, K and trace elements), and Ca ammonium nitrate plus superphosphate, with or without  $\text{K}_2\text{CO}_3$ . In a series with different amounts of N, growth proved best with 40–80 kg. N/ha. Reduced growth at 80–120 kg. N was probably due to root competition from heavy grass growth, absent from the plots given smaller doses of N.

1725. ROBAK, H., and NEDKVITNE, K. Et 25 år gammelt forsøk med gjødsling av gran på røsslyngmark. [A 25-year study on adding fertilizer to Norway Spruce on *Calluna* sites.] *Medd. norske Skogforsk.* 14 (No. 48), 1957 (401–11). 6 refs. [Nor.e.]

Plots were treated with Trollmjøl (finely ground  $\text{CaCN}_2$  containing 20% N and 60% CaO), alone or along with basic slag, in 1930, before planting in 1931. Plant heights were measured in 1933, 1950 and 1955. The  $\text{CaCN}_2$  killed the heather on the treated plots and alone, or still more with basic slag, significantly increased height growth above that of untreated controls.

1726. HVIID, A. Dyrkning av rødgran på mager bund. [Growing Norway Spruce on poor soil [with comments by H. A. Henriksen and E. C. L. Løfting, and replies by the author].] *Dansk Skovforen. Tidsskr.* 42 (2; 4–7), 1957 (73–132; 244–8; 296; 316–20; 383–5). 30 refs. [Dan.]

Discusses research on soil improvement in Germany, especially that at Erdmannshausen and Syke [cf. *F.A.* 18 No. 1589] and by Wittich [see *F.A.* 14 No. 1882], and in the Netherlands, and compares their practice with Danish conclusions that soil cultivation and liming on heathland favour rapid early growth, with shallow rooting, and attack by *Fomes annosus* [cf. *F.A.* 15 No. 3729]. Discusses the possible effect of trace-element deficiencies, as a result of use of fertilizers, on failures of plantations on such soils, and briefly describes experiments laid out in 1956 to test this possibility. Discusses some failures in detail, and makes recommendations, emphasizing the need for maintaining a balance between organic matter, major nutrients and trace elements, using mixtures of species, planting shelter-belts to reduce storm damage, etc.

1727. MØLLER, C. M., and SCHAFFALITZKY DE MUCKADELL, M. Skovbrugsafdelingens gødningsforsøg i rødgran. [Research by the forestry section [of the Royal Veterinary and Agricultural College] on treating Norway Spruce with fertilizers.] *Dansk Skovforen. Tidsskr.* 42 (8), 1957 (391–453). 25 refs. [Dan.dan.e.]

Reports on 25 fertilizer experiments laid out in 1953 [see *F.A.* 17 No. 2784]. The effect of treatments is assessed from height in 1952 and annual height increment from 1953 to 1955. Fertilizers

applied per ha. were: N, 300 kg. 15.5%  $\text{Ca}(\text{NO}_3)_2$ ; K, 100 kg. 50% KCl; and P, 200 kg. 18% superphosphate. N/2, K/2 and P/2 indicate half the above dosages and NPK the full dose of all 3 fertilizers. Results are shown in graphs. In the 9 experiments on site classes 0–3, there was no response to K and K/2, doubtful response to P and P/2 and N and N/2, and response to NPK only in the 6 most reliable experiments (those with the smallest values for standard deviation). In 4 experiments on site classes 3–4, there was a large but variable response to NPK, a slight response to N and N/2, doubtful response to P and P/2, and no response to K or K/2; there was no correlation between P response and  $F_i$  (index of available phosphoric acid). In 12 experiments on site classes 4–7 there was definite response to N, N/2 and NPK, and a small, doubtful response to K and P; no correlation was found between response to P or K and  $F_i$  or  $T_k$  (index of available K). Needle analyses were made of samples taken in Dec. 1955 from two plantations. Results include the following: (1) % increase of K, N, and P was about the same and corresponded roughly to amounts applied; (2) there was a pronounced positive correlation of figures for N, chlorophyll, and increase in increment; (3) the N-treated plot showed a definite negative correlation of chlorophyll, N and increment on the one hand and K and P content on the other; (4) the C/N ratio of plots fertilized with N, NPK and 3 NPK fell, the fall being roughly proportional to the increased N content. The effect of fertilizers on *Pinus mugo*, present in mixture, was slight. The experiments will be continued in the hope of determining e.g. whether the favourable effect of N applications will continue and whether K and P will have more effect after several applications. Experiment with urea have also been laid out.

1728. [Applications of fertilizer to Japanese Larch.] *Korte Meded. Bosbouwproefsta., T.N.O., Wageningen* No. 30, 1957 (10). [Du.]

Growth of annual shoots of young Larch at Ruinen, treated with various phosphate fertilizers at the rate of 200–400 kg. pure phosphate/ha., was 5–6 times that of the controls; insoluble natural phosphate was as effective as superphosphate. On the Hoge Veluwe trial area application of phosphate at 50 kg./ha. had very little effect, and application of Ca reduced growth. The effect of fertilizers varied considerably at different sites, even on identical soil types. In older stands, applications of phosphate increased the N content of both soil and needles.

1729. BEARD, J. S. Recent experiments on fertilizer with Black Wattle [in S. Africa]. *J.S. Afr. For. Soc.* No. 28, 1956 (39–49). 4 refs. [E.e.afrik.]

Results of a comprehensive experiment laid down in 1949 in plantations under regeneration are described, together with those of a number of subsidiary ones. Neither Ca nor N proved beneficial, while K gave weak responses only on certain sandy soils. Superphosphate was highly beneficial on all Wattle soils; raw phosphate disappointing. The



superphosphate, equally effective in powder, granular and tablet form, acts as a 'starter fertilizer'. For soils on Table Mountain sandstone, 200 lb./acre, and for all others 400, is the recommended standard. It should be applied in holes or furrows within 6 months of regeneration. [Cf. *F.A.* 14 No. 2219.]

### 238. Timber Plantation Crops requiring Special Treatment

See also Nos. 1420, 1624, 1717, 1768-9, 2612.

1730. MARCHESIN, L. La madera del álamo y saúce en la industria del fósforo. [Poplar and Willow wood in the match industry.] *Forestal, B. Aires* No. 3, 1957 (9). [Span.]

In the Poplar (mainly *Populus* × 'A.M.') plantations of the Compañía General de Fósforos Sudamericanos S.A., the following methods are used: original spacing 3 × 3 m. (1100 plants/ha.); first thinning at 5-6 years leaving 800 plants/ha.; second thinning at 9-10 years leaving 500/ha.; third thinning at 14 years leaving 300/ha.; final felling at 18 years when average estimated height will be 25 m. and d.b.h. 27 cm.

### 24. Tending of Stands and Trees

1731. SIREN, G. Kokemuksia raivaussahaista. [Experiences in a tentative comparison of clearing tools.] *Metsät. Aikak.* 1957 (3), (60-70). [Fie.]

Investigations in 1954-56 showed that a heavy clearing saw was better than a brush knife or axe for weeding seedling stands, thinning young second-growth stands and clearing cut-over land for reproduction. Six power saws of different designs were tested for suitability for different types of work. *From author's summary.*

1732. LOYCKE, H. J. Vergleichende Untersuchungen über Pflegesägen. [Comparative tests of handsaws for tending and pruning.] *Forst- u. Holzw.* 12 (19), 1957 (334-9). [G.]

Describes field operations and controlled tests with 160 makes of saw (gardeners' bow-saws, one- and two-man bow-saws, straight and curved pruning saws, Grecian saws) of various sizes, shapes, tooth-shape and pattern, tensions, materials etc. for horizontal and vertical cutting in the cleaning of conifer and hardwood thickets etc. In general, a gardener's bow-saw 40-45 cm. long proved most suitable. High-quality steels and improved tooth shapes (other than the traditional triangular shape) greatly improved performances. Grecian saws, though slower with stems > 5 cm. in diam., required less working space. The Jiri saw, a slender hand-saw, 60 cm. long, working on the draw stroke, was suitable for felling stems 8-35 cm. diam. of soft (conifer or broadleaved) woods, though not in very dense stands, and was the only saw superior to axes in that diameter range.

### 241. Cleaning

1733. KÖSTLER, J. N. Die Auslese-Idee Schädelins in der Anwendung auf Fichtendickungen mit Mischbaumarten. [The application of Schädelin's selection ideas to mixed Spruce thickets.] *Allg. Forstzeitschr.* 11 (11), 1956 (149-57). 16 refs. [G.]

A lecture, discussing problems of 'negative' and 'positive' selective tending [cf. *F.A.* 15 No. 1350], chiefly in connexion with the regulation of mixtures of Spruce with Silver Fir, Beech, Pine and Larch, illustrated by examples of naturally or artificially regenerated stands of varying structures.

1734. BITTER. Grundzüge der Kiefernjugbestandspflege und deren Nutzenanwendung im Forstamt Quint. [The main principles of tending young Pine stands and their application in Quint Forest District [Eifel].] *Forst- u. Holzw.* 12 (21), 1957 (369-72). [G.]

Discusses the need for and the methods of tending between the earliest stages and first thinnings, their planning and organization, tools, costs etc., distinguishing: (1) young growth, aged 5 to 10 years, ≤ 2 m., (2) thickets, aged 8 to 15, 2-5 m. and (3) stands entering the pole stage. In order to maintain even density, wolf trees should be cut back rather than removed.

### 242. Thinning

See also Nos. 1292, 1558, 1574, 1730, 2069, 2156, 2172, 2605.

1735. [Problems of thinning and tending.] *Allg. Forstzeitschr.* 11 (16/17), 1956 (217-31). Many refs. [G.]

A special number devoted to the discussion—on progress in this paper for some time—on thinning intensity, with articles on: Yield studies and forestry practice (*H. J. Arnswaldt*), stressing the economic aspect; Natural limits of thinning intensity (*E. Thielmann*) advocating moderate thinning for poor Spessart sites; and translations of articles by *S. Bjerke* and *K. F. Andersen* [cf. *F.A.* 19 No. 419] and *P. V. Voropanov* [cf. *F.A.* 12 No. 99].

1736. CARBONNIER, C. Ett gallringsförsök i planterad granskog. [A thinning trial in planted Spruce.] *Svenska SkogsFören. Tidskr.* 55 (5), 1957 (463-76). 13 refs. [Sw.g.]

Thinning trials were begun in 1906 and plots were examined at roughly 5-year intervals. Plot I was not touched apart from the removal of dead trees, II was given light low thinning, III heavy low thinning and IV heavy low thinning in 1906 and 1911 and thereafter very heavy low thinning. In 1955, when the stand was 81 years old, total volume per ha. had decreased with increasing severity of the thinning grade but net value and 'W-value' (present value of all future net yields) had increased, the latter to a considerable extent (values of 100, 140, 168 and 185% for I, II, III, and IV respectively). Volume increment for the period 1906-26 was highest for III and IV and for 1926-55 for I and II. Analyses of needles from 10-15 dominants in each of plots I-III in 1956 showed N content increasing with severity of thinning. Root rot increased after 1931 and was most serious on the heavily thinned plots. It reduced net value by 6.6% on II, 9.0% on III, and 10.4% on IV, but the W-value was still considerably higher in the heavier thinning grades. Storm resistance was reduced by heavy thinning and plots III and IV were practically destroyed by the

storm of Jan. 1956, while I and II suffered little damage.

1737. DONALD, D. G. M. **The effect of various thinning grades on the growth and volume production of *Pinus pinaster*.** *J. S. Afr. For. Ass.* No. 28, 1956 (50-4). [E.e.afrik.]

Plots laid out in 1921 in an ABC Latin square had initial densities of 2400/acre, reduced in 15 years to 1000 (a), and in 20 years to 300 (b) and 150 (c). In 1955 the stand value/acre (in sawlogs and small wood) for (a), (b) and (c) was respectively ca. £206, 251, and 350, plus thinnings increasing in amount and value in the same order. Grade (c) thinning is recommended to-day, but initial density was here 5 times that of present practice.

1738. STAEBLER, G. R. **Design for a test of commercial thinning on the Hemlock Experiment Forest in Western Washington.** *J. For.* 55 (11), 1957 (810-4). 4 refs.

Discusses the requirements generally and outlines the lay-out of one particular (statistically controlled) experiment applying low and crown thinnings at 3- and 6-year intervals in a stand of Western Hemlock.

1739. STOECKELER, J. H., and ARBOGAST, C. F. **Dominant and codominant Sugar Maple trees should be favoured in thinning young stands.** *Tech. Note Lake St. For. Exp.* No. 509, 1957. pp. 2.

Presents data on the response, 16 years after thinning, in a sapling stand of northern hardwoods in Wisconsin. Earlier observations were confirmed [see *F.A.* 10 No. 1054]. Dominant Sugar Maple trees retained their relative position; most co-dominants and intermediates selected as crop trees because of good stem form did not improve their position in the canopy. Thinning reduced mortality among co-dominants in the heavily thinned plots by 50% as compared with the unthinned plots; but 45% of intermediates on the heavily thinned plots were suppressed or dead. Intermediates should not be chosen as crop trees.

1740. PARDÉ, J. **Réflexions sur l'éclaircie dans les futaies de chêne. [Considerations on the thinning of Oak forest.]** *Bull. Soc. for. Franche-Comté* 28 (8), 1957 (426-34). 6 refs. [F.]

Summarizes the views of the principal schools of thought on this controversial subject and gives some data on thinning experiments carried out at Nancy.

1741. KOSHI, P. T. **Diameter growth of Post Oak best in sparse stands.** *J. For.* 55 (11), 1957 (847).

When the b.a. of a Post Oak (*Quercus stellata*) stand was reduced to 13 sq. ft./acre, the annual diam. increment u.b. increased to 0.14 in. as compared with 0.07 where the b.a. was 65 sq. ft./acre.

#### 243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 1756, 2073.

1742. MINCKLER, L. S. **Response of pole-sized White Oak trees to release.** *J. For.* 55 (11), 1957 (814-5).

Preliminary results show that White Oaks ranging

from 35 to 100 years responded well to release from overhead shade in hardwood stands in S. Illinois; diam. increment was 46% higher than for unreleased trees.

1743. GRETH, J. W. **Ax girdling kills large cull hardwoods.** *Sta. Note Cent. St. For. Exp. Sta.* No. 107, 1957. pp. 2.

In the Kaskaskia Experimental Forest, S. Illinois, hardwood stands of Hickory, White, Red, Black and Scarlet Oak and Blackgum were notch girdled and the treated trees (ca. 3800 in all) examined after one or 3 years. The largest trees were most easily killed; mortality rose from 51% for trees of 5-7 in. d.b.h. to 87% for trees  $\geq$  18 in. The season of treatment did not greatly influence Oak mortality, though trees died more rapidly when girdled in the growing season; but more Hickory and Blackgum were killed then. Mortality figures were lower for trees examined after one year, showing that it takes  $\geq$  2 years for some trees to die.

1744. GYSEL, L. W. **Effects of silvicultural practices on wildlife food and cover in Oak and Aspen types in Northern Michigan.** *J. For.* 55 (11), 1957 (803-9).

In the Lower Michigan National Forest in 1950 various methods were practised of releasing 10- to 15-year *Pinus resinosa* from a hardwood overstorey of predominantly *Quercus ellipsoidalis*, *Q. rubra* and *Q. alba*, viz. girdling trees above, and felling trees below, 4 in. d.b.h., or applying 2,4,5-T or 2,4,-D as a basal spray, as an aerial spray, and in frills. Results were analysed after 5 years according to the amount of food provided for wild life. All the methods for releasing Pine were successful, except the basal spray treatment; and crown diameter and height growth of Pine on the successfully treated stands were twice those on controls. There was considerable increase in the amount of browsing material, particularly from stool coppice shoots, on felled plots. The use of chemicals reduced the coppicing ability, the amount of browse so produced being half that on the felled plots. An attempt at bulldozing stems  $\leq$  5 in. d.b.h. was only moderately successful in increasing browse in Oak stands, but in Aspen stands markedly increased the numbers of coppice shoots. In additional experiments, Aspen stands were (a) clear-felled, or (b) trees below merchantable size were left; the number of coppice shoots was much greater in (a).

1745. LOTTI, T. **An effective control of cull hardwoods.** *Res. Note Stheast. For. Exp. Sta.* No. 108, 1957. pp. 2. 1 ref.

When a 1/20 mixture of 2,4,5-T and fuel oil was applied in late spring in frill girdles on trees 6-30 in. in diam., left after a harvest cutting in Santee Experimental Forest, only 69 out of 997 were alive after 14 months. Of the 20 species, which included Sweetgum, White and Red Oaks, Hickories etc., only *Ilex opaca* showed substantial resistance; 37 man-hours and ca. \$50 worth of fluid sufficed for 13 acres with a b.a. of ca. 34 sq. ft./acre.



1746. HENRY, P. W. T. **Operation X. The removal of the shelterwood.** *Inform. Bull. Dep. For. Res. Nigeria* No. 46, 1957. pp. 8. 1 ref.

For four 20-acre plots, the total costs of poisoning with Na arsenite all uneconomic species of g.b.h. (1) > 6 ft., (2) > 1 ft., (3) > 1 ft., overshadowing valuable poles and saplings, and (4) as for (3) but with re-poisoning of survivors at 12 months, were respectively 129, 430, 318, and 289 + 47 shillings.

1747. LEA, J. D. **The effect of ring barking and 2, 4, 5-T applied as a bark paint on *Acacia seyal* Del.** *E. Afr. agric. J.* 23 (2), 1957 (89-90).

Band-girdling 1 ft. wide at 4 ft. caused 83% mortality in 2 years against 11% for painting a similar but unbarked band with 2% acid equivalent in diesel oil. Recommendations are: 1st dry season—band-girdle; 2nd dry season—protect the area from fire; 3rd—fell the dead trees and burn.

1748. BEVERIDGE, A. E. **Arbicide trials in lowland dipterocarp rain forest of Malaya.** *Malay. Forester* 20 (4), 1957 (211-25). 7 refs.

Recent small-scale trials at the Forest Research Institute, and extended field trials in districts, have indicated that 2,4,5-T butyl ester may be an acceptable non-toxic arbicide for replacing the toxic Na arsenite which is now used extensively for killing unwanted trees. Under Malayan conditions, 2,4,5-T is most effective when applied to a frill girdle in a solution of diesel oil. Provided that care is taken not to waste the arbicide, 2,4,5-T of 10 lb. per gallon acid equivalent at 2% in diesel oil kills 80% of the unwanted trees in one year at a cost comparable with use of an aqueous solution of Na arsenite. In these trials the new hormone-type arboricides were less effective when applied as basal sprays to unbroken bark; water-borne emulsions of mixed 2,4,5-T and 2,4-D were less effective than solutions of 2,4,5-T in diesel oil. *Author's summary.*

## 245. Tending of Trees, Pruning etc.

See also Nos. 1732, 1768, 1968.

1749. BALDWIN, H. I. **Club pruning at low temperature.** *J. For.* 55 (10), 1957 (732-6). 3 refs.

Experiences in 1954 in knocking off twigs and small branches with a club at temperatures between 5 and -28° F. showed that Larch could be pruned very easily by this method (for branches > 1 in. diam.) and Norway Spruce, White Pine, Balsam Fir and Scots Pine relatively easily. Possible damage to trees cannot be assessed at this stage. The method is suitable for cleaning trials, and probably for shaping Christmas trees, and is a cheap way of pruning trees having many fine twigs, e.g. Larch and Spruce, where saw pruning would prove too expensive. It is not recommended for crop-tree pruning.

1750. BENBEN, K. **Podkrzesujemy młode topole.** [**Pruning young Poplars.**] *Las Polski* 31 (13), 1957 (4-6). [Pol.]

Poplars should first be pruned in the transplant beds, taking only the lateral shoots near the base. In plantations, the pruning should be started in the

4th or 5th year; further prunings should be done every 2 years, later every 3, and then every 5 years. The twigs and branches should be > 1 cm. thick when pruned. The best time for pruning is June-July, for although this is the period of the most intense sap circulation, it is also the time of intense callus growth; later pruning results in insufficient callus thickness, whereas earlier pruning unduly prolongs the time during which the wound is exposed to infection, and often leads to the formation of strong epicormics. Callus growth can be stimulated by covering the wound with 'gardener's tar', a Polish manufacture.

1751. SKILLING, D. L. **Is the epicormic branching associated with hardwood pruning wounds influenced by tree crown class?** *Tech. Note Lake St. For. Exp. Sta.* No. 510, 1957. pp. 2. 1 ref.

Crop trees in an 11-year-old stand of Sugar Maple, American Elm, American Basswood and White Ash, were pruned to half their total height in 1938; heavy and light thinnings were also made. Observations after 19 years on 93 trees of all crown classes, showed that epicormic branching round pruning wounds was rare on dominant and co-dominant trees but increased sharply on Sugar Maple of the intermediate and suppressed classes. Data for the other species are limited. The thinnings had no significant effect on epicormic branching.

1752. GRANO, C. X. **Pruning-wound closure on Southern Red Oak.** *J. For.* 55 (9), 1957 (669).

After pruning trees of *Quercus falcata* in S.E. Arkansas (average d.b.h. 6.4 in.), 98 wounds were measured. After 5 years 85% of the wounds had healed, and  $\frac{2}{3}$  of the open wounds were sound. Poor diameter growth usually resulted in slow healing. There was no evidence that pruning wounds contributed significantly to decay.

1753. ILIESEI, V. A., *et al.* **Cultivarea arborilor cu lemn de calitate superioară (fără noduri).** [**Growing trees with high-quality (knotless) timber.**] *Rev. Pădurilor* 1957 (10), (657-9). [Rum.russ.g.f.e.]

A preliminary report on an experiment in bud-pruning of *Abies alba*, describing the design of the experiment.

## 25. Treatment of Defective, Derelict or Very Open Stands

See also Nos. 1715, 2093.

1754. STEINER, D. **Die Verbesserung der Šikara.** [**Rehabilitating the šikara [scrub forest].**] *Schweiz. Z. Forstw.* 108 (10/11), 1957 (611-2). [G.]

Describes measures in the extensive areas of poor scrub of Oak and other hardwood species in Jugoslavia, made possible after a general exclusion of goats (which in Montenegro alone resulted in the slaughter of 1 million goats). Fencing, cutting back of scrub growth and planting gaps with (chiefly) *Pinus nigra* have given promising results.

1755. RAY, R. G. **Patch cutting in second growth Balsam Fir at Matane, Que.** *Pulp Paper Mag. Can.* 58 (10), 1957 (180...205).

Gives data on volume and increment for 5.7 sq.

miles representative of 200 sq. miles mainly of *Abies balsamea* with *Picea mariana*, *P. glauca*, *Thuja occidentalis*, *Betula papyrifera*, and *Larix laricina*, from which sawlogs were cut about 1900 and pulpwood since 1920, leaving the forest broken up into patches, accentuated by windfall. Clear felling in patches up to 30 acres, but retaining even-aged and 2-storeyed windfirm stands is the object. The arrangement of cutting classes (modified Norwegian classification [cf. *F.A. 13 No. 2358*]), the regulation of the cut, actual yields, residual growing stock, and future plans are discussed.

1756. ALEXANDER, R. R. **Preliminary guide to stand improvement in cutover stands of Spruce-Fir.** *Res. Note Rocky Mt. For. Range Exp. Sta. No. 26*, 1957. pp. 6. 1 ref.

In 1944 ca. 60% of the merchantable volume of an old-growth stand of Engelmann Spruce/Subalpine Fir in the Fraser Experimental Forest, Colorado, was removed; in the understorey (d.b.h. 3.6-9.5 in.) of Fir/Spruce/Lodgepole Pine, the Fir predominating, plots were subjected to improvement fellings of two intensities:—(a) removing all trees except Spruce and Pine of good form and vigour, (b) removing only defective and poor-vigour trees and also releasing Spruce and Pine from Fir as necessary. The same number of plots were left as a control (c). Improvement felling caused considerable mechanical damage, so that the average b.a./acre was 10.44 sq. ft. on (a) and 21.44 sq. ft. on (b), compared with 37 sq. ft. on (c). After 11 years the b.a. of each plot was practically unchanged. Spruce showed a small net increment on the treated plots; Fir a small net increment on all plots; Pine a reduction in mean b.a. in all plots, despite low mortality, since many of the trees left proved to be of low vigour. In 1955 the understorey trees were evaluated as future growing stock. The % of desirable trees was 66 on (a), 55 on (b) and 43 on (c). Factors considered in marking, e.g. mechanical injuries, disease, tree form and vigour, are tabulated as a guide to marking for improvement fellings.

1757. CARVELL, K. L. **Convert unproductive hardwood stands to desirable forest types.** *Bull. W. Va. agric. Exp. Sta. No. 408*, 1957. pp. 10.

Experiments in the conversion of hardwood scrub forest to conifers by poisoning or bulldozing, followed by planting, indicated that costs were uneconomic (\$43.57-80.92/acre). Bulldozing, though more expensive, was more effective than poisoning as a means of disposing of the hardwoods, since regrowth was negligible.

1758. MILLER, W. D., and MAKI, T. E. **Planting Pines in pocosins [wet upland bogs].** *J. For.* 55 (9), 1957 (659-63). 3 refs.

In 1936, 6 permanent  $\frac{1}{4}$ -acre plots of Loblolly Pine and 3 of Slash Pine were established, at spacings of  $4 \times 4$ ,  $6 \times 6$  or  $8 \times 8$  ft. in a drained upland bog in N. Carolina. Measurements after 19 years show that both species grow satisfactorily. The number of trees with a d.b.h.  $> 8$  in. is considerably higher for the  $8 \times 8$  ft. spacing, but total and merchantable volumes are higher for the  $6 \times 6$  ft. spacing.

Observations in stands planted in 1936 on 400 acres show that the volume increment of Pine is considerably higher in drained than in undrained areas.

## 26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

See also No. 1591.

## 261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See also No. 1886.

1759. CONKLIN, H. C. [Shifting cultivation. Vol II.] **Hanunóo agriculture: a report on an integral system of shifting cultivation in the Philippines.** *FAO For. Developm. Pap. No. 12*, 1957. pp. 209. 188 refs.

A detailed study of a small section of a small upland group on the island of Mindoró. This is a case of almost perfect equilibrium between man and his environment, and no changes are suggested. [Cf. *F.A. 18 No. 2860*.]

1760. SCHLIPPE, P. DE. **Shifting cultivation in Africa: the Zande system of agriculture.** Routledge & Kegan Paul, London. 1956. pp. xxxi + 304 + 9 gphs., 95 photos. Price £2. 2s.

A partly anthropological, partly agronomical study of the system, which is practised in a large part of the Belgian Congo and French Equatorial Africa. The main thesis is the conflict between this system, which is in equilibrium with the environment, and the social and economic revolution caused by the impact of Western civilization.

1761. BIERNAX, J. **Une méthode de mise en défense des savanes dans le territoire de Thysville, s'appuyant sur la pratique coutumière de 'nkunku'.** [A method of rehabilitating savanna lands in the Thysville region [Belgian Congo], based on the native practice called 'nkunku'.] *Proceedings 2nd Inter-african Soils Conference, Léopoldville 1954, 1955* (843-66). [F.f.e.] O.R.E.

Describes measures designed to rehabilitate over-exploited savanna soils by temporary reforestation. After earlier schemes using planted firebreaks of various species, including *Eucalyptus citriodora*, *E. robusta* and *Cassia siamea*, had proved unsuccessful, the revival and extension of the native system of forest fallow gave high promise. In this method, firebreaks 4 m. wide, enclosing circular areas ('nkunku'), are cleared of brush, which is then carefully burned. The protected 'nkunku' remains the property of the former owner (or owners) who see to it that it remains unburnt. Re-vegetation with woody species is rapid on most soils and additional planting is often done with useful fuel and pole species, e.g. *Pentaclethra macrophylla*, *Millettia laurentii*, *Ficus* spp., *Albizia* spp., and there is soon a useful supply of fuel and poles. Since 1951, ca. 10,000 ha. have been thus protected, and an annual increase of 4000 ha. is planned. It is intended to cut the forest after ca. 20 years and once more use the land for cultivation, repeating the



process elsewhere. The excessive length of fire-breaks, in relation to the small area enclosed, is a drawback, particularly as labour for making and maintaining them is scarce, but this is more than outweighed by the willing co-operation of the population.

1762. NYE, P. H., and HUTTON, R. G. Some preliminary analyses of fallows and cover crops at the West African Institute for Oil Palm Research, Benin. *J. W. Afr. Inst. Oil Palm Res.* 2 (7), 1957 (237-43). 1 ref.

A long-term rotation trial was established in 1947 to compare the merits of (a) natural bush fallow and (b) a quick-growing coppice tree, *Acioa barteri*, in restoring fertility after cropping [cf. *F.A.* 16 No. 4097]. It will be some years before there are sufficient data from test crop yields to compare the merits of the fallows, so in order to determine whether any obvious chemical advantage accrued from a planted fallow, the nutrients stored in (a) were compared with those in a 6-year-old (b). Total dry weight of (a) is nearly twice that of (b), but the nutrients stored are in general no greater than those in (b) because of the low nutrient content of the wood that forms the bulk of its dry weight. In all, (a) contains about half as much P and K as (b), but rather more Ca and Mg. The weight of mineral elements stored in (b), expressed as their equivalent weight in common fertilizers, gives some idea of the importance of the minerals added to the soil when the fallow is cleared and burned. It contains, per acre, the equivalent of the P in 570 lb. superphosphate (18%  $P_2O_5$ ), the K in 620 lb. KCl, the Ca in 210 lb. lime, and the Mg in 460 lb.  $MgSO_4$ ; the N is largely lost in the burning.

## 262. Fuel and Fodder Forests

See Nos. 1605, 1697.

## 263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

1763. KREMBS. Graupappel in den Donau-Auen. [*Populus canescens* in the flood-plains of the Danube.] *Allg. Forstzeitschr.* 11 (27/28) 1956 (345-7). [G.]

A lecture describing site conditions, particularly near Ingolstadt, where this Poplar, which can be grown on sites unsuitable for Black Poplars, occurs naturally. Its variability suggests that it may be a post-glacial hybrid of *P. tremula* and *P. alba*. Selection and breeding trials are discussed, including the clone 'Ingol 7', which can be propagated from cuttings.

## 264. Farm Forests

See Nos. 2179, 2563, 2583-5.

## 265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See also Nos. 1341, 1768.

1764. RASCHKE, G. Baum und Strauch am Ufer. [Trees and shrubs on banks [of water-courses, harbour basins etc.].] *Holzucht, Reinbek* 11 (3), 1957 (19-21). 2 refs. [G.]

Chiefly a summary of two papers by G. Wandel

published for the Ministry of Economics and Transport of Rheinland-Westfalen, describing the effect of natural vegetation—grass, shrubs, and trees—and plantings on bank stability and wind protection on the shipping canals and rivers of the area, analysing the causes of failures. Isolated trees, though frequently holding their own stretch of bank, have not prevented erosion. On exposed bends etc. *Salix acutifolia* has proved successful because of its exceptional root development.

## 266. Shelterbelts, Windbreaks

See also Nos. 1322, 1476, 1683, 2553.

1765. CABORN, J. M. Shelterbelts and microclimate. *Bull. For. Comm. Lond.* No. 29, 1957. pp. vii + 135 + 28 photos. 206 refs. Price 17s. 6d.

Part 1 reviews the literature (mostly continental or American); Part 2 discusses research procedure; Part 3 describes the author's own studies (in the field and in wind tunnels) at Edinburgh [see *F.A.* 17 No. 3962] mainly on the effect of shelterbelts on wind velocity, and discusses their bearing on the lay-out and tending of shelterbelts.

1766. [Effect of shelterbelts on crops.] *Meded. Inst. toegep. biol. Onderz. Nat.* No. 31, 1957 (14-5). [Du.]

In the dry lands of Gelderland and the eastern part of N. Brabant and in Limburg, oats were not affected by the shelter received, but yields of rye and potatoes were increased by 12-15%, and those of maize significantly increased. In Zeeland, yields of apples and pears rose by between 30 and 150%, and financial yields of strawberries, because of the earlier harvest, by 30-50%.

1767. LUPE, I. and CATRINA, I. Contribuții la îmbunătățirea metodei coridorului pentru perdele de protecție. [Suggested improvements to the 'corridor' method of designing shelterbelts.] *Bul. ști. Acad. Repub. rom. (Sect. Ști. biol.)* 6 (1), 1954 (183-202). 6 refs. [*Rum.russ.f.russ.f.*] L.S.

Describes the lay-out of 'corridor'-type shelterbelts in which each group of 2-3 rows of fast-growing species mixed with shrubs is separated from the next by a 'corridor' planted with slower-growing species. The advantages of this lay-out (increased growth of the 'corridor' species, ease of tending and facility of mechanization) are offset by certain disadvantages (mechanical damage to young trees in the corridor from accumulations of snow and from branches falling from the fast-growing species, and the creation of conditions favourable to fungus diseases). It is proposed to obviate these dangers by substituting for the dense bands of fast-growing trees and shrubs a single row of fast-growing trees, choosing species with sparse branches and foliage.

1768. BAUER, F. [Editor]. Pappelanbau in der Landwirtschaft. [Agricultural Poplar growing.] *Allg. Forstzeitschr.* 11 (6), 1956 (66-82). [G.]

A special number devoted to Poplar growing outside the forest, including articles on opportunities and experiences on Keuper in Franconia, river valleys in Hesse, shelterbelts etc. in the Lower Rhine region, and industrial waste lands in Bavaria. In

an article by *Moegling* on pruning, MCV wound dressing (M. Barthel and Co., Regensburg) is recommended. [Cf. *F.A.* 19 No. 1420.]

1769. JOACHIM, H. F. Bericht über eine Pappelstudienreise in die Tschechoslowakische Republik. [Report on a Poplar study tour in Czechoslovakia.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (59–68). [G.]

Covers distribution of native Poplars and cultivars, propagation, sites, management, utilization, injuries, research, particularly breeding etc. with a description of the use of Poplars and other species in extensive shelterbelt plantings.

1770. SHAW, E. W. A new look at shelterbelts. *Amer. Forests* 63 (12), 1957 (18–9, 47–9).

Outlines the main conclusions from a survey of shelterbelts in the Great Plains, 20 years after planting, with regard to the performances of individual species.

1771. JOHNSON, L. P. V. The role of natural selection in the improvement of shelterbelt trees. *Agricultural Institute Review, Ottawa* 12 (5), 1957 (13–4, 36). O.R.E.

Briefly describes observations on isolated trees in woodland/prairie transition zones and on trees in old shelterbelts showing special hardness, arguing that survivors under such unfavourable conditions should be used to provide seed for further afforestation and shelterbelt plantings. Progeny tests with Green Ash showed that the hardy trees were slow-growing types.

## 268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 1754, 1886–7, 1897 *et seq.*, 2563, 2581.

1772. ST. GEORGE-GRAMBAUER, T. D. Plants poisonous to livestock. *Journal of the Department of Agriculture of South Australia, Adelaide* 60 (6), 1957 (253–64, 272).

Discusses factors affecting toxicity, and lists numerous plants, the symptoms they cause etc., including some shrubs or trees, e.g. *Indigofera australis*, *Eucalyptus cladocalyx*, *Gastrolobium bilobum*, *Myoporum* spp., *Exocarpus cupressiformis*, *Sambucus nigra*, *S. gandichandiana* etc.

## 27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

1773. KUMAR, M. National highway avenues. *Indian For.* 83 (12), 1957 (693–706).

Discusses advantages and disadvantages, choice of species, protection and plantation technique, for roadside trees in India.

## 28. Husbandry of Forest Products Other than Wood

### 282. Bark Crops

See Nos. 1603–4, 1716, 1729, 1870, 2007, 2050–1, 2519, 2522.

## 283. Fruit and Seed Crops etc.

See Nos. 1458, 1463, 2611.

## 284. Crops Tapped for Exudations etc.

See also Nos. 1359, 2537.

1774. MINCKWITZ, H. VON. Die Fichtenharznutzung im Thüringer Schiefergebirge in früherer Zeit, besonders im ehemaligen Fürstentum Schwarzburg-Rudolstadt. [The old-time Spruce resin industry in the Thuringian Schiefergebirge, particularly in the former principality of Schwarzburg-Rudolstadt.] *Arch. Forstw.* 6 (5/6), 1957 (441–60). 21 refs. [G.g.russ.e.]

Traces the history, from the 16th century, of the servitudes, at first not negotiable leases, but later sub-let, sold and bequeathed; the gradual supersession, as the major industry, of resin by timber as demand and price for the latter rose; the damage done by the resin collectors and distillers, and early rules for their control and supervision; the decline of the industry in competition with imports from the U.S.; tapping by armed bands from Bavaria, and the final extinction of rights by purchase, 1827–62. Economic data from the archives are quoted.

1775. STEPHAN, G. Die Bedeutung der Risszeit und der Rissführung für die Leistung bei der Kiefernharzung. [Effect of streaking time and method of working the face on the resin yield of Scots Pine.] *Arch. Forstw.* 6 (5/6), 1957 (432–40). 1 ref. [G.g.russ.e.]

Reports 4 years' work on the yields got by varying the following tested standard (variations in brackets): (a) weekly tapping cycle; (b) herring-bone face with streaks 0.6 cm. wide, 3 mm. deep (depth variations 1, 2, 5, and 8 mm.); (c) angle of streaks with central vertical gutter, 70°; (d) streak interspace, 2 mm. (5 and 10 mm.); (e) proportion of stem circumference not occupied by face  $\frac{1}{2}$  ( $\frac{1}{2}$ ,  $\frac{1}{6}$ ,  $\frac{1}{10}$ ). In addition (f) hour at which fresh streaks were made (6–7, 11–12 a.m. and 6–7 p.m.); and (g) 2-storey tapping (faces separated by 35, 70 and 105 cm.) were tested. Each treatment comprised 40 faces, and for comparability the seasonal yields were expressed per streak per metre of face width (g./face-metre). For (b), the accepted depth of 3 mm. was best but little better than the greater depths. In (d), increases to 5 and 10 mm. gave increases of ca. 15% and 25%, but the quicker upward extension of the face reduces the number of years it can be tapped. In (e), yields decreased with  $\frac{1}{6}$  and  $\frac{1}{10}$  and increased with  $\frac{1}{2}$ , the latter not warranting the considerable decrease in face-metres involved. In (f) streaking at 6 p.m. gave increased yields (ca. 6%—but not statistically significant) throughout the season as compared with morning tapping; from late May to early September there was actually a significant increase of 9.7%. Differences are probably caused by evaporation. In (g) the yields of faces so separated did not diverge significantly. Assuming a normal yield of 100 g./streak/face-metre, each yielded 70 g., i.e. 40% more than a single face.

1776. Sección de resinas y productos derivados. Experiencias de producción de miera. [Section for



resins and derivatives. Experiments in resin production.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (105-8). [Span.]

Presents some data from experiments in progress with *Pinus pinaster* and *P. radiata* to test the efficiency of different tapping systems.

1777. PAPAIÖANNOU, I. K. Hē sēmasia tēs rētinokalliergeias en Helladi. Peiramata rētineuseōs epi tēs chalepiou peukēs dia tēs methodou erethismou dia theiikou oxeos. [The significance of the cultivation of resin-producing woodlands in Greece. Experiments in the tapping of Aleppo Pine [*Pinus halepensis*] using  $H_2SO_4$  stimulation.] *Epistēmōnikē Epeitēris, Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* No. 3, 1955/1956 (281-363). 24 refs. [Gk.e.]

[Cf. *F.A.* 16 No. 490.] Reports in detail on the first season's (1 May-16 Oct. 1956) results of comparative trials of (1) the U.S. 'bark face', (2) the standard Greek face (similar to the French but only ca. 31 cm. long and 11.5-12.5 cm. wide), both employing 7-, 9-, 14- and 20-day f.c. freshening cycles (f.c.) each with 30, 40, 50, 60, and 70%  $H_2SO_4$  spraying, as compared with (3) controls (the standard Greek practice of a 7-day f.c. without stimulation). There were 140 trees in each variant made up of two separate groups of 70 trees, the total of 5600 trees making up a stand in Kassandra-Chalkidike at the N.E. extremity of *P. halepensis* in Greece. In (1) all variants save the 20-day f.c. gave higher yields per tree than (3), the 50%  $H_2SO_4$  giving the highest (up to 57% more for the 7-day and only 2% less for the 20-day f.c.), and all variants gave more per sq. m. of face. In view of U.S. experience the author advocates at least a 5-years' extended trial of a 9-day f.c. to see whether yields fall appreciably under this regime, and points out that Greek conditions should make the 14- and 20-day f.c.'s more profitable for the larger operations, lower costs of production more than offsetting the smaller yields from the longer f.c.'s. Acid stimulation, which broadens the faces, is not suitable for the long-term, narrow-faced tapping favoured locally, e.g. in Angistri Island (4-7 cm.) and Sofiko (7-10 cm.), where regeneration is very slow. In (2), although the pattern of results was somewhat distorted by varying numbers of first-year faces among the test groups, the yields per tree generally averaged somewhat higher than those of (1) and showed an even greater superiority over their controls, the 50%  $H_2SO_4$  again giving the highest yields (up to 73-74% more for the 7-day f.c. even when the spraying was omitted at every other freshening, and, as in (1), only 2% less for the 20-day f.c.) but the yield per sq. cm. of face was much less than in (1), though higher than (3).

Method (2), which allows the acid to penetrate deeply, results in excessively long annual faces (up to 64-69 cm. on a 7-day f.c.) as compared with (1) or (3) and is deprecated except for trees due to be felled shortly. It was also noted that normally high-yielding trees (e.g. mature, large-crowned) when acid-treated yielded progressively less through the season, whereas ordinary low yielders gave progressively more.

Method (1) was continued on a 9- to 10-day f.c. with 50%  $H_2SO_4$  but without professional supervision or recording of yields, in the following season, during which no damage to the trees was noticed but the oleoresin produced proved much harder to get out of the cups and containers.

The financial implications of the yields from each f.c., using 50%  $H_2SO_4$  are presented and discussed, both for the small farmer-tapper and for operators (generally lessors) employing labour.

1778. NAGHSKI, J., and WILLITS, C. O. Maple sirup. IX. Micro-organisms as a cause of premature stoppage of sapflow from Maple tap holes. *Applied Microbiology, Baltimore* 3 (3), 1955 (149-51). 11 refs. L.S.

Analysis of the sap flows from 4 bore holes in one tree, one of which was kept sterile, supplemented by tests with artificial infection, indicated that premature drying of holes was correlated with the growth of micro-organisms (mostly bacteria, but also moulds and yeasts) and not with physical drying, warm weather favouring the growth of such organisms. Losses in yield by premature stoppage may amount to 20-75%; losses in quality also occur.

## 287. Bamboo and Cane Growing etc.

1779. SWAMY, S. K. The culm selection system. *Indian For.* 83 (12), 1957 (711-2). 3 refs.

Proposes the term 'culm selection system' for the usual method of management of *Dendrocalamus strictus*, in which fellings are conducted on a 3- or 4-year cycle, leaving all 1-year-old culms and a few mature culms for support.

## 288. Crops Grown for Animal Products

1780. YAMAZAKI, H., NISHIMURA, K., and TAGUCHI, R. [Change of leaf qualities induced by the regenerative [coppice] growth of *Quercus* tree and their relation to growth and cocoon production of the wild silkworm, *Antheraea yamamai* Guérin.] *Journal of Sericultural Science of Japan, Tokyo* 24 (2), 1955 (118-26). 10 refs. [Jap.e.] L.S.

When Oak trees were cut back to 1.5-1.8 m. above ground in early spring, the leaves of the new shoots were darker, larger and thicker than those of controls. Their water and protein content per unit of dry matter was greater, their content of carbohydrates, crude fibres, crude ash, and other extracts was lower, and their feeding value, expressed in % of sound larvae and pupae, cocoon weight etc., was greater. *From authors' summary.*

1781. YAMAZAKI, H., NISHIMURA, K., and TAGUCHI, R. [Seasonal changes in the contents of starch grains in *Quercus* trees for the feed of wild silkworm (*Antheraea yamamai* and *A. pernyi*).] *Journal of Sericultural Science of Japan, Tokyo* 24 (5/6), 1955 (413-9). 19 refs. [Jap.e.] L.S.

Analysis of stems and branches of 6-year-old Oaks in Ariake district, Naganoken, indicated that seasonal changes were most marked in terminals, but were independent of age. Maxima occurred just before shoot growth and before leaf discoloration, minima during rapid elongation of shoots and in midwinter. In connexion with the

winter decrease, an increase in sugar was observed, but none in fats. Accumulation started at the outer side of the cortex and proceeded inwards; decrease started in the bark. Within the wood, both increase and decrease were uniform throughout the tissue. A special tissue for storing starch grains was found to develop between periderm and primary cortex of the stems and branches from mid-September to early October. *From authors' summary.*

1782. [A study of bee botany.] *Rep. For. Dep. Tanganyika 1956, 1957 (25).*

A study of sources of nectar was made by analysing and identifying the pollen grains found in honey. From field observation it was then possible to determine how the various plants were distributed on the ground, and from periodic weighing of the hives in conjunction with pollen determination, the seasons

of nectar flow from the different plants could be told. The work also proved useful for general botanical research, particularly in the relationship of the various groups of Caesalpiniaceae.

1783. SMITH, F. G. *Bee botany in East Africa. E. Afr. agric. J.* 23 (2), 1957 (119-26). 2 refs.

Describes the author's methods in forming a reference collection of pollen samples and accompanying herbarium specimens for the identification of pollen found in honey and hive material, and gives notes on East African vegetation units (*Brachystegia* forest, mountain grassland and savanna, deciduous thicket, *Acacia* grassland and bush, dry and wet types of montane forest) as bee pastures. Photographs of pollen grains include those of *Brachystegia* spp. and *Julbernardia [Isoberlinia]* sp.

### 3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD : LOGGING AND TRANSPORT. FOREST ENGINEERING

#### 30. Work Science (Work Studies): General

1784. SZÁSZ, T. Erdőgazdasági munkatudományi vizsgálatok. [Investigations on work science in forestry.] *Erdész. Kutatás., Budapest 1957 (1/2), (113-28).* [Hu.russ.e.g.]

These first Hungarian studies cover specifications of local hand tools; correct maintenance of felling saws for the 7 chief timbers; effect of axe weight and stump height on output and energy consumption and proportion of timber in the yield; a delimitation of the fields of use of the pruning axe, bow- and felling saw. Workers' nutrition, diseases and accidents are under survey.

#### 301. Methods of Study

1785. SCHUBERT, W. Statistische Arbeitszeituntersuchungen in der Holzindustrie. I. Verteilzeitermittlung mit Hilfe der Multimomentaufnahme. II. Praktische Durchführung von Multimomentaufnahmen. [Statistical work studies in the wood industry. I. Ascertaining general times by activity sampling. II. Practical activity sampling.] *Holz-Zbl.* 83 (122; 125), 1957 (1479-81; 1527-8). 16 refs. [G.g.]

Describes the application of this modern technique to the problems of woodworking industries and discusses its advantages over traditional production studies, points to be watched, statistical accuracy, and uses.

#### 302. Man and Work (Physiology and Psychology)

See No. 2596.

#### 303. Training in Work Science and Efficiency

See No. 2600.

#### 304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 1794-5, 1804, 2338, 2352.

1786. KOŠUŤIĆ, S. Osvrt na primenu higijensko-tehničke zaštite rodnika u eksploataciji šuma. [The

application of health [and safety] measures for labour engaged on forest exploitation.] *Šumarstvo* 10 (5/6), 1957 (389-92). [Serb.]

Gives data on the number of accidents, fatal and otherwise, that occurred in forest exploitation in Yugoslavia between 1948 and 1955. The rate of accidents is consistently higher than for any other branch of industry, which the author attributes to a neglect of elementary precautions and of existing regulations. The need for improving amenities, e.g. sleeping conditions and availability of first aid, is stressed.

1787. *Protecil dans l'industrie du bois. [Protecil in the wood industry.] Rev. int. Bois* 24 (231/232), 1957 (158). [F.]

Note on a silicone-based barrier cream, effective against dermatitis caused by wood, and skin affections caused by wood preservatives. It is manufactured by Éts. Protecil, Arinthod, Jura.

#### 307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 1579, 1589, 1621, 1714-5, 1731-2, 1884.

1788. SMITH, C. Redskabsdemonstration i Haderslev Vesterskov d. 24 Maj 1957. [Demonstration of implements at Haderslev Vesterskov, 24 May, 1957.] *Dansk Skovforen. Tidsskr.* 32 (9), 1957 (455-77). [Dan.]

The tools and equipment demonstrated are briefly described and illustrated. They include: the Ras and Viggo I barking machines; the Ferguson 35, and M.A.N., Unimog, Holder and Bungartz tractors, with accessories, e.g. winches, tongs, ploughs, and planting-hole borers; and other tools, e.g. a motor saw for cutting scrub, a planting spade and a hand winch.

1789. *Machines and equipment. Wood* 22 (10), 1957 (424-5).

Includes descriptions and illustrations of a machine for incising timber before impregnation (Whites of Hebburn (Engineers) Ltd.); a veneer



slicer (Guilliet Sons & Co. Ltd.); the Hydraclamp handling attachment, comprising two steel jaws operated independently, suitable for use with a tractor (W. E. Bray & Co. Ltd.); a portable planer (J. K. O. Cutters Ltd.); and the Drott Grubber Blade (International Harvester Co. of Great Britain Ltd.).

1790. **Equipment section.** *Unasylva* 11 (4), 1957 (190-2).

Includes specifications and illustrations of: Wakins mechanical slab and edging debarker (Sumter Mfg. Co., York, Ala., U.S.A.); Beckman pocket pH meter (Beckman Scientific Instrument Div., Fullerton, Calif.); a firewood splitting machine (M. Glover and Co., Hercules Engng. Works, Leeds, England); Wheland automatic lumber sorter (Wheland Co., Chattanooga, Tenn., U.S.A.); Bouffard truck-mounted log-loader (Universal Log Loaders Ltd., Eastview, Ont., Canada).

1791. **Logging machinery directory.** *Timberman* 58 (11), 1957 (66 . . . 116).

Complete illustrated list of equipment on show at the 48th Logging Congress, Seattle, Oct. 1957, under name of company, exhibit and its description (ca. 63 items), etc.

### 308. Planning (Organization) of Work

1792. STENTZEL, E. E. Organizationsprobleme der Waldarbeit. [Problems of organization in forest work.] *Arch. Forstw.* 6 (5/6), 1957 (343-60). [G.g.russ.f.]

A lecture covering the implications of machines, materials and men; repetitive and diverse work; individual, gang, and brigade; a continuous system; and the distinction between site-bound work on static material (solved by a light cross-country vehicle with tool-carrying attachments) and work at forest landings and sawmills with fixed machines operating continually on moving material (for which solutions are proposed, especially roller feeds, containers and overhead carriage).

### 32. Felling and Related Operations

#### 322. Felling Season. Preparatory Measures

See also No. 1839.

1793. BINKO, I., KOLÁŘ, J., and MÜLLER, K. Spruce bark from chemically barked trees. *Věda a Výzkum v Průmyslu Kožedělném, Czechoslovakia* 1, 1956 (27-46). [Cze.] From *abstr. in Chem. Abstr.* 51 (16), 1957 (12526). P.R.

Bark of *Picea abies*, loosened by applying  $\text{Na}_3\text{AsO}_3 + \text{NaOH}$ , contained only ca. half as much water-extractable tannin as normal bark. The tannin yield can be greatly increased by extracting with dilute NaOH or  $\text{Na}_2\text{SO}_3$ , but the resulting liquors are high in carbohydrate materials and behave more like lignosulphonate extracts than like true tanning extracts.

#### 323. Felling and Subsequent Primary Conversion

See also Nos. 1802-10.

1794. LISIČKIN, F. I. Tehnika bezopasnosti na

valke derev'ev. [Safety techniques in tree-felling.] *Lesn. Prom.* 1955 (10), (19-20). [Russ.]

Classifies trees into four groups from the point of view of safety: (1) inherently safe trees (normal stems); (2) stems deviating from the vertical or with a very asymmetrical crown; (3) lodged or broken stems; (4) rotten or dead stems. Several Russian tools used for the felling of more difficult stems, such as levers, jacks, and hand-operated winches, are illustrated and described.

1795. WYMAN, E. P. A safer method of directional felling control with the chain saw. *J. For.* 55 (11), 1957 (846).

After the back cut is started, a step ca. 3 in. deep and 10 in. high is sawn out as near the ground as possible, a car jack (slightly modified) inserted and a strain taken on it. The back cut is then completed, the saw removed, and the tree jacked over. With a 12-ton screw jack, Pine of nearly 30 in. d.b.h. and 90 ft. high can be safely felled against the lean.

#### 325. Sorting and Assortments of Wood in the Rough

See Nos. 2490-1.

#### 326. Sequence of Operations (including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

1796. LAMP, I. Eindrücke von einer Studienreise in Russland. [Impressions of a study tour in Russia.] *Allg. Forstztg.* 68 (23/24), 1957 (337-41). [G.]

Describes, with illustrations, the sequence of logging operations, equipment used, composition and performance of crews, etc. In one area, trees are felled by power saw so as to fall directly on to a specially constructed tractor, whose winch assists in bringing the trees down, and which moves from tree to tree until fully loaded. It then carries the whole load of trees either to intermediate landings for trimming with electrical tools, or straight to highly mechanized conversion and sorting sites by the railway, where all branchwood is immediately conveyed to a chipper which cuts it into short lengths for use as fuel at the power station providing the electricity. All barking is done at the saw- or pulp-mill.

1797. FAUST, E. Beitrag zum Thema Rationalisierung und Mechanisierung des Holzeinschlages. [Rationalization and mechanization of logging.] *Forst- u. Holzw.* 12 (23), 1957 (412-6). [G.]

Describes a large-scale trial in a private forest estate at Braunfels [Taunus Mts.] in which operations were sharply divided into felling, primary conversion, and transport, involving, as far as possible, untrimmed tree or tree-length logging, leading to more efficient use of skilled manpower, power saws and tractors (Unimogs). Another successful innovation was the bundling of cordwood with steel bands and with the help of a circular hinged frame [cf. *F.A.* 17 No. 1642].

1798. GLÄSER, H. Die Arbeitsgestaltung beim Einsatz von Einmannmotorsägen im Holzeinschlag. [Sequence of operations in logging with one-man

power saws.] *Allg. Forstzeitschr.* 11 (15), 1956 (206-8). 5 refs. [G.]

Discusses machine costs/hour for actual sawing times, estimated on the basis of work studies at 1-2 hours in Spruce and 2.5-3 hours in Beech per 2-man shift. Two-man work and full-tree or tree-length skidding, with primary conversion on well organized working sites is recommended for most conditions. [Cf. *F.A.* 17 No. 478.]

1799. SCHRANK, M. Windwurfauflösung durch baumweises Rücken nach Prof. Dr. Gläser. [Salvaging windthrown timber by full-tree extraction by Professor Gläser's method.] *Forst- u. Holzw.* 12 (20), 1957 (348-51). [G.]

Describes operations in 2.5 ha. of 40-year Spruce, where ca. 4000 trees were thrown in a dense tangle, and the improvement, both in logging costs and workers' earnings, brought about by changing from the dangerous and laborious work of initial conversion at site, to conversion at landings manned each by a 3-man team, to which the whole, untrimmed stems were pulled, in bunches, by a tractor approaching from the side of the original storm.

1800. PLATZER, H. B. Planung der Aufarbeitung grosser Windwurf- und -bruchflächen. [Planning salvage work on large windthrow areas.] *Forst- u. Holzw.* 12 (20), 1957 (345-7). 5 refs. [G.]

Problems discussed include the sequence of operations and size of gangs, simplifications of initial conversion (reduction in number of assortments), provision of special roads and landings, and of special gear, and adjustments to piece rates [cf. *F.A.* 18 No. 48]. The use of two-man power saws on stems lying under tension is dangerous.

### 33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 1799, 1800, 1823, 2069.

1801. CURTIS, O. F. Influence of herbicides and fertilizers on stump decay. *Proc. 11th N.theast. Weed Control Conf.* 1957 (293-9). 4 refs. From *abstr.* in *Weed Abstr.* 6 (7), 1957 (1022). O.R.E.

Stumps of Apple and Pear trees were treated with Ammate (80%  $\text{NH}_4$  sulphamate) at 40-120 g./stump, or with 2,4-D + 2,4,5-T at 100 g. in oil. Various fertilizer applications were then repeated over a 3-year period during which resistance of the stumps to mechanical breakage and penetration was rated. Moderate applications of N salts with phosphate promoted softening of the stumps, but the heaviest rates had a preservative effect. Unless phosphate was included, N alone had no measurable effect on softening. The herbicides also tended to hasten softening.

### 34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See Nos. 1815, 1839, 2453-8.

### 35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See Nos. 1800, 2119.

### 36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 1731-2, 1784, 1788, 1790-1, 1794, 1796-8.

1802. Eine neue Rindenschälmaschine. [A new barking machine.] *Holz-Zbl.* 83 (139), 1957 (1695). [G.]

Describes a German log barker, said to be suitable for every type of bark and for use in forest or sawmill, and available in both portable and stationary models. An electric 2-h.p. motor drives a barking tool that works like a drawknife; it is pulled by a cable mechanism and guided by hand. A log-turning device is incorporated in the machine.

1803. SALMINEN, J. Käyttötuloksia Veikko II kuorimakoneesta. [Performance data of the Veikko II barking machine.] *Tied., Metsäteho, Helsinki* No. 135, 1957. pp. 23. [Fie.]

[Cf. *F.A.* 19 No. 480.] The new model is mobile, weighs ca. 500 kg., has a continuous feed, and barks logs > 1 m. long and 2-16 in. in diam. Its power requirement (12-15 h.p.) is supplied by combustion engine or tractor. In a short study, 2-m. Spruce and Pine pulpwood was barked at feed rates varying from 17.9 to 6.9 m./min. as log diameter increased from 8 to 20 cm. The average rate was 11.5 m./min. and the corresponding output 9.1 unbarked stacked cu.m./hour with a team of 3-4 men. Quality was above that for hand barking. Experience in the field has shown a 3-man team to be most suitable, giving an average output of ca. 50 unbarked stacked cu.m. of unfrozen softwood in 8 hours. Production falls when barking at very low temperatures. Fuel consumption is 0.8 litres per unbarked stacked cu.m., using a 10-12 h.p. petrol engine and 0.25-0.35 litres using a diesel engine. Barking costs are 0-30% below those for hand barking.

1804. Evolution of the power saw. *Timber of Canada* 18 (11), 1957 (23... 52, 60, 83).

Includes articles on the 100-year history of patents; chain-saw safety; detailed costing of chain saws in pulpwood harvesting (*B. H. Hunt*); detailed instructions on sharpening and maintenance, particularly in winter (*R. G. Waddell*); and an illustrated review of the models of 18 makers and of the components and accessories of 5 others.

1805. CONROY, J. J. Development leading toward a better power chain saw. *For. Prod. J.* 7 (10), 1957 (59A-60A).

Discusses recent developments, particularly in engine design, including recent Swedish diesel engines, and the problems of friction, lubrication, chain design etc. created or increased by the new high speeds.

1806. KUOSMAN, V. V., and DREHSLER, M. M. Universal'nye pil'nye cepi. [Universal sawing chains.] *Lesn. Prom.* 1956 (2), (11-5). [Russ.]

Presents in graphs the results of tests with 4 types of chain saw: (1) the usual PC-15M with conventional teeth; (2) the PCU-1, with gouge-type teeth only; (3) the PCU-2 saw, in which gouge-type teeth alternate with conventional teeth, and (4) the



PCU-3 saw, in which gouge-type teeth are separated by 2 conventional teeth. The characteristics of the gouge-type teeth were as follows: front bevel angle  $20^\circ$ ; side clearance angle,  $3^\circ$ ; sharpness angle of the gouge edge,  $40^\circ$ ; hook,  $3^\circ$ , and top clearance angle,  $10^\circ$ . The tests were made on green Spruce, Aspen and Birch wood, with moisture contents of 61–72.2, 75–90.5 and 80.1–96.3% respectively; a total of 2850 samples being cut. It was found that: with (2) the sawing output (in sq. m./sec.) was practically independent of both the sawing angle  $\alpha^\circ$  (angle between the cutting velocity vector and the grain direction) and the feed angle  $\beta^\circ$  (angle between the feed-velocity vector and the grain direction), whereas with (1) the output fell considerably when the sawing angle was  $< 30^\circ$  and still more when the feed angle was  $< 75^\circ$ . The cutting force and the feed force increased considerably in (1) when the value of either angle decreased from  $90^\circ$  to  $0^\circ$ , whereas these forces varied only slightly in (2). The sawing output of (2), working with Spruce, as a function of the angle of incidence, first decreased up to an angle of ca.  $40^\circ$ , then increased up to  $105^\circ$  where a discontinuous peak (cusp) was reached, after which it gradually fell again until  $180^\circ$  was reached. Power consumption increased for (1) quite steeply as the sawing angle decreased from  $90^\circ$  to  $0^\circ$ , but remained practically constant for (2). The specific work in cutting increased for (1) as the sawing or feed angle decreased, but remained nearly constant for (2). Saws (3) and (4), while superior in performance to (1) were found to give less favourable results than (2). [Cf. F.A. 17 No. 2863.]

1807. KUOSMAN, V. V., and DREKHSLER [DREHSLER], M. M. **Universal sawing chains.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3258, 1956. pp. 7 + 1 photo, 2 dgms., 5 gphs. Transl. by M. Slade from *Lesn. Prom.* 1956 (2), (11–5) [see preceding abstract]. Limited distribution. P.R.

1808. LASTOČKIN, P. V., and SERGEIČEV, N. I. Obrezka suč'ev petlevoj sučkorezkoj. [Trimming by means of a 'loop' branch-trimming saw.] *Lesn. Prom.* 1955 (12), (20–1). [Russ.]

The saw, designed in 1952–54 by the Leningrad Academy of Forestry, consists simply of two flexible 'spiral' [twisted through  $90^\circ$ ] blades with [conventional?] teeth. The blades are both hinged at one end to a solid iron element having an eye for threading a tensioning cable, while the remaining opposite, free ends are fitted with hook-shaped lugs. The butt end of the felled tree to be trimmed is clasped between the two blades whose free ends are then connected by two short chokers to a fixed cable attached to a post, and the eyed ends to the cable of a winch. The compound saw is thus made to fit snugly round the circumference of the stem, which is dragged by another winch through the saw. Results of experimental trimming of ca. 1000 cu.m. of timber showed that: (1) best results were obtained with conifers; (2) curved and many-forked stems were difficult to work with; (3) the maximum thickness of the branches cut was 80–100 mm.; (4) the quality of the trimming achieved conformed to

the Soviet standard for trimming stems  $> 7\text{--}8$  cm. diam., and (5) the time required for trimming one tree (mean volume 0.4 cu.m.) was ca. 85 sec. The saw is recommended for Spruce/Fir and Aspen/Birch mixtures, using also a hand-operated trimming saw for curved logs or for thick branches.

1809. **Mobile wood saw harvests Lodgepole.** *Timberman* 58 (11), 1957 (40–1, 118).

A note on highly mechanized production of 8-ft. logs: felling and trimming by Homelite EZ6 power saw, tree-length skidding up to 800 ft. by D4 caterpillar and Hyster rubber-tyred arch, cross-cutting by 60-in. circular saw powered by GE 25-h.p. motor, automatic loading on lorries. The mobile installation is readied for transport in  $< 30$  min.

1810. HUTSON, H. P. W. **Hints on the care and use of axes.** *Timb. Technol.* 65 (2220), 1957 (510–3). Illustrated by 21 drawings.

1811. FRASER, D. A. **A light portable tower to facilitate measurement of vertical gradients in tree studies.** *Tech. Note For. Br. Can.* No. 62, 1957. pp. 5. 3 refs.

Describes, with photograph and plans, a sectional tower of magnesium-alloy tubing, extensible to a height of 60 ft., with a platform that can be established at the top of each section. The tower, which can be dismantled and erected at another site in a few hours, was designed at Petawawa for the purpose of making microclimatic observations at different levels of a tree.

### 37. Transport

#### 372/377. Land Transport

See also Nos. 1788–92, 1796–9, 1809, 2119, 2188, 2196, 2513.

1812. **The handling and transport of timber in mountainous regions.** [Publ.] FAO/ECE *Jt. Comm. Working Tech. No. FAO/EFC/LOG. 65-A*, 1957. pp. 94 + 9 photos, 5 dgms., 3 gphs.

Includes the following papers (languages indicated for each): Extraction of timber from mountain forests managed for sustained yield (*H. J. Steinlin*) [F.e.russ.]; The most economic spacing for cableways (*H. J. Steinlin* and *F. Hafner*) [F.e.russ.]; Skyline cranes of the automatic blocking type and of the 'Blondin' type: proposed method for comparative tests (*X. de Mégille* and *F. Hafner*) [F.e.russ.]; The use of cableways in the mountain forests of Rumania (*Anon.*) [F.e.russ.]; Forest light railways with cable haulage in the U.S.S.R. (*V. A. Troubetskoy*) [F.e.]; The haulage of timber by ground line and winch in the U.S.S.R. (*I. P. Abol*, *V. I. Alabiev* and *A. A. Rentsev*) [E.f.]; Compacting the surface of forest roads (*F. Hafner*) [F.e.russ.]; The use of flumes in Rumanian forest operations (*Anon.*) [F.e.russ.]

1813. ZURBRÜGG, F. Informe al gobierno de México sobre extracción de madera en las zonas montañosas. [Report to the Mexican government on the extraction of timber in mountainous regions.] Expanded Technical Assistance Program, FAO,

Rome. *FAO Report No. 707*, 1957. pp. 43 + 5 dgms., 4 photos. [Span.]

Considers, for two important zones, Pitales Leticados (Guerrero) and Uruapan (Michoacán) and for different types of terrain, the most convenient extraction methods (by cableway or by other means), and presents data on equipment, performance and costs.

1814. LESKINEN, S. Pinotavaran metsäkuljetus sulan maan aikana. [Timber transport in the forest in summer.] *Metsät. Aikak.* 1957 (6), (213-7, 223). 2 refs. [Fie.]

Findings from experiments in the forest of Tampella Oy, include: (1) the most profitable log length is 4 m., followed by 3 and 2 m.; (2) the load should be well forward on the vehicle; (3) amounts skidded in a 7-hour day over a distance of 200 m. ranged from 10.5 to 16 cu.m. stacked measure. The minimum for profitability, 14 cu.m./day, can be reached with careful organization of work and selection of tools; (4) where topographical conditions are more difficult than normal, the profitability of skidding over more than 200 m. is doubtful; (5) residual trees and seedlings were no more damaged than in winter. *From author's summary.*

1815. ANDERSSON, Å., and KARLSSON, I. Upp-lagsplatserna och virkesvärden: en transportkalkyl från Västra Skedvi. [Landings and care of logs: transport calculations from West Skedvi.] *Skogs-ägaren* 33 (10), 1957 (292-4, 297). [Sw.]

Summarizes a study on the effect of storage on quality, and costs by (1) horse skidding to the motor road, (2) winching to the tractor, with tractor transport to a control storage depot, and using a properly laid-out tractor road network. Concludes that except in young stands, (2) will be more economic, and that greater mechanization is desirable.

1816. GRAY, D. W. Tree-length wheeled skidding. *For. Prod. J.* 7 (10), 1956 (386-9).

Describes operations in a mixed Jack Pine and in a Poplar stand in Ontario where a 4-wheel-drive truck fitted with winch and logging arch was used to skid tree-lengths a distance of 3000-4000 ft. to a landing for immediate conversion into logs or pulpwood. Advantages claimed include high productivity, low unit costs, wide applicability in summer and winter etc.

1817. LEH, A. Ëffektivnost' vyvozki lesa v hlystah. [Efficiency of tree-length skidding.] *Lesn. Prom.* 1955 (10), (16-9). [Russ.]

A technological and economic comparison of the yields of two logging operations, skidding timber in tree-length and short logs respectively, concluded in favour of the former (2.62 as compared with 1.67 cu.m./man-day).

1818. VOTČINEV, N. V., and ISTOMIN, I. D. Odnoputnaja podvesnaja kanatnaja doroga dlja podvozki drevesiny v gornyh uslovijah. [A single-cable skyline cableway for timber transport in the mountains.] *Lesn. Prom.* 1955 (8), (9-12). [Russ.]

Illustrated description of a cableway (up to 3 km.

long), in which a cable of 25-36 mm. diam. is hung from a cross-piece supported on spars 4-6 m. high. Logs or log bundles up to 12 m. long and 2 tons in weight are hung from pairs of sheaves running along it, there being 55 such pairs per km.; they are moved by an endless main cable, 15.5 mm. diam., driven by a TL-3 winch, on which the free sheaves are returned to the loading point. Maximum gradient uphill is 20%; maximum downhill, 30%. An average of 120 cu.m. was carried per 8-hour shift. The new cableway is working satisfactorily in the mountainous regions of the Ukraine.

1819. ALJAB'EV, V. I. Puti razvitija trosovoj trelevki lesa. [Development of methods of skidding with the use of cables.] *Lesn. Prom.* 1955 (12), (11-2). [Russ.]

Compares the performance, from the technical and economic standpoint, of the TL-3, L-19, L-20 and TL-4 winches. The type of winch to be used depends, *inter alia*, on the size of the trees. Up to 0.3 cu.m. the tractive force should be 3-5 tons; for 0.3-0.8 cu.m., 6-8 tons; and above 0.8 cu.m., 10-12 tons.

1820. PANCER, A. V., and ALJAB'EV, V. I. Agregatnaja trelevočnaja lebedka TL-4. [Multipurpose skidding winch, type TL-4.] *Lesn. Prom.* 1955 (10), (8-13). [Russ.]

A detailed illustrated description of the design and operation of an improved model, fitted with drums for skidding and for turning tree-length logs and loading them on transport vehicles; it also has an electric generator for supplying electric saws with power and illuminating the felling site. Maximum cable length on the working drum is 350 m. The model with an internal combustion or diesel engine, plus generator, weighs ca. 4 tons. It can also be supplied with an electric motor (without generator).

1821. PANCER, A. V., and URIN, JA. M. Novaja trelevočnaja lebedka TL-5. [A new skidding winch, type TL-5.] *Lesn. Prom.* 1956 (4), (16-20 + 2 photos). [Russ.]

Illustrated description of the design and operation of a new winch that possesses numerous advantages over the L-19 and L-20 winches. It weighs, with cables, ca. 6 tons; a special sheave can be rapidly substituted for one of the drums when endless-cable working is desired. The maximum tractive force on the main drum is 6 tons; length of the load-carrying cable, 500 m.; maximum skidding distance, 750 m. The drums are pneumatically controlled. The winch, tried out since late 1955, has so far produced 100 cu.m./shift (7.1 cu.m./man-shift), and 80-90 cu.m./shift (10 cu.m./man-shift), for the unidirectional and reversed-cable motion, respectively.

1822. SPIERS, J. Mobile spars could be applied to N.Z. logging work. *N.Z. Timb. J.* 3 (12), 1957 (30-2).

Describes wooden spars, truck- and track-mounted spars, large steel spars, the Burrard steel tower, Madill steel spar and Skagit mobile skyline used in N. America, and lists 6 essentials for mobile spars of easy local manufacture.



1823. CAROW, J., and RUTH, R. H. In logging old growth Douglas Fir, mobile yarder shows promise in salvage. *Timberman* 58 (10), 1957 (66-9, 104, 108). 4 refs.

Compares costs of salvage logging with a Skagit SJ4 Yarder in old-growth Douglas Fir with those of conventional high-lead clear felling, with data on value of timber won and damage to standing trees.

1824. Der Einachstraktor in der Forstwirtschaft. [The two-wheeled tractor in forestry.] *Wald u. Holz* 39 (3), 1957 (58-61). [G.]

Describes and illustrates the many uses of such a tractor with trailer and other accessory equipment for cultivation, logging (winch) etc. Essential requirements for a forest tractor are considered to be: a motor of at least 10-12 h.p. with adjustable rev./min. (for use as a stationary engine with a winch etc.), adjustable clearance and wheel track, several forward and reverse gears, and a driving shaft fore and aft.

1825. DOBROMYSLOV, B. Traktor KT-12 s dopolnitel'noj lebedkoj na gornoj trelevke lesa. [The KT-12 tractor with supplementary winch in skidding operations in the mountains.] *Lesn. Prom.* 1956 (3), (19-20). [Russ.]

To ensure continuous motion of the load-carrying cable, transmitted by a self-propelling winch unit, the lespromkhozes in the Stanislav region (N. slopes of Carpathians in the Ukraine) have had the KT-12 fitted with two identical winches instead of the customary single winch, the second being used for applying tension to the cable. Output of up to 40-50 cu.m. per shift (distance 150-200 m.) is claimed.

1826. BARENBAUM, L., ŠATALIN, G., and AL'TMAN, S. Skol'zjaščee pogruzočnoe ustrojstvo na traktore KT-12 dlja trelevki derev'ev s kronami. [A sliding loading device on the KT-12 tractor for full-tree logging.] *Lesn. Prom.* 1955 (8), (12-5). [Russ.]

The insufficient width and strength of the loading plate on the KT-12 tractor make the skidding of whole trees butt-end first very difficult. The authors designed an improved plate which is much stronger and is equipped with an inclined support and a 4-wheeled carriage. The new device is described and illustrated in detail, and its advantages emphasized.

1827. ANDRONOV, V. K. Trelevočnyj dizel'nyj traktor TDT-40. [The diesel-engine TDT-40 tractor for skidding.] *Lesn. Prom.* 1955 (12), (17-9). [Russ.]

This tractor is an improved version of the KT-12A tractor (itself an improved KT-12), embodying a 42-h.p. D-40 diesel engine, the performance of which is described. The maximum tractive force is 3.27 tons (vs. 2.98 for KT-12A). Several tractors of this model are being tested under working conditions.

1828. LEPENCOV, P. A. Novyj trelevočnyj traktor TDT-54. [The new skidding tractor TDT-54.] *Lesn. Prom.* 1955 (12), (16-17 + 2 photos). [Russ.]

Illustrated description of its construction, operation and performance. The max. load of 4 tons enables 12-15 or 9 cu.m. of wood to be skidded,

depending on whether the trees rest on the loading plate with their top or butt. The principle of operation is the same as in the KT-12 tractor, but the design shows many differences. The engine is the 54-h.p. diesel D-54.

1829. PARFENOV, G. M. Traktory S-80 na podvozke lesa k traktorno-ledjanyj dorogam. [The S-80 tractors used for bringing timber to tractor ice-roads.] *Lesn. Prom.* 1955 (9), (7-9). [Russ.]

Illustrated description of the application of S-80 tractors for skidding logs to ice-roads; the shuttle-service principle is adopted, and a special set of collecting cables and chokers is used. An output of 90-120 cu.m./shift has been attained for each tractor.

1830. URТАEV, G. T. Avtopoezdnaja vyvozka lesa po ledjanyj dorogam. [Timber transport in lorry-driven sledges on ice roads.] *Lesn. Prom.* 1955 (11), (9-12). [Russ.]

Tabulates the maximum weights of sledge trains when pulled by lorries on ice or snow roads, for different gradients (1-6%) and for 6 different types of lorry. Methods of arranging a sledge train with an ordinary and a logging lorry are illustrated and described. Two plans for the organization of the log depot are suggested.

1831. LEPITRE, C. Transports grumiers en Côte d'Ivoire. [Transport of logs on the Ivory Coast.] *Bois For. Trop.* No. 55, 1957 (25-37). [F.e.span.]

The author investigated and analysed the efficiency of various lorries and combinations of lorry and semi-trailer, and plots curves of load frequency in terms of volume, for several types.

1832. THIELMANN, K. Die internationale Automobil Ausstellung in Frankfurt mit den Augen des Forst- und Holzwirts gesehen. [A forester's view of the international motor-car exhibition at Frankfurt.] *Holz-Zbl.* 83 (120), 1957 (1451-2). [G.]

Describes lorries, trailers (including dual-purpose convertibles), winches, logging tractors with 4-wheel drive (30 to 80 h.p.) with logging and road-building equipment, 4-wheel-drive vehicles of the jeep type etc., of German manufacture, and a heavy French tractor (Latil) designed for the tropics, with a winch that can be raised to form a logging arch capable of supporting stems of 4 cu.m. volume.

1833. ECKERT, K. H., and REHSCHUH, D. Selbstentladende Spezialfahrzeuge für den Schicht-holztransport. [Special vehicles for transporting cordwood with an automatic dumping device.] *Forstarchiv* 28 (10), 1957 (215-6). [G.]

Illustrations and technical details, including cost, are given for 4 German makes of cordwood truck: the Splettstösser, the Schomann, the Siedschlag and the Trittau. All are operated by one man and have a device for dumping their load, the last by a hydraulic or mechanically worked lever.

1834. KALINOVSKIJ, V. P., and PLINER, L. A. Električeskij kran povyšennoj gruzopod'emnosti. [An electric crane of increased hoisting power.] *Lesn. Prom.* 1956 (2), (15-6). [Russ.]

A detailed, illustrated description of electric

cranes designed for railway work, which were used in 1955 in a lespromkhoz for loading logs into standard-gauge railway trucks. The cranes (of Austrian manufacture) have a maximum lifting capacity of 8 tons at 6-m. boom length, and 3 tons at 15 m. The load can be transported either by hook or grabs. The comparative performance per hour and per man, and the cost of loading per cu.m. are tabulated for this crane, a smaller electric and a steam crane; the 8-ton crane is by far the best

1835. VOEVODA, D. K., and KAPLUN, JA. M. Četyrehrogij zahvat dlja pogruzki korot'ja avto-pogruzčikami. [A four-prong catch-fork for the loading of short logs by means of lorry-loaders.] *Lesn. Prom.* 1955 (8), (20-1). [Russ.]

A special catch-fork has been designed, constructed and tested at the CNIIME Institute; it is mounted on a 3-ton or 5-ton lorry-loader and enables short logs to be lifted, loaded on to rolling stock or stacked together. Each pair of prongs can handle 0.7-1.5 cu.m. of logs up to 1.3 m. long. The device weighs ca. 700 kg. Its design, operation and merits are described.

1836. LE RAY, J. Chargement par treuil et cable aérien. [Loading by means of winch and aerial cable.] *Bois For. Trop.* No. 56, 1957 (33-43). [F.e.span.]

Describes an adaptation of the high-lead system of the U.S. Pacific Coast, using a two-drum winch and a cable running through a high block attached to a spar or standing tree, to loading of lorries in Nigeria and Ghana. Technical details are described and illustrated, and the advantages of the method discussed. The only drawback is the relatively high cost of the installation and the need of trained personnel to work it.

### 378. Water Transport

1837. BAHAREV, P. M. Racional'nye metody splava lesa v hlystah. [Rational methods of floating [rafts of] tree-length logs.] *Lesn. Prom.* 1955 (11), (16-20). [Russ.]

The basic unit in this method is the load of tree-length logs, whose volume is determined by the carrying capacity of the rolling-stock unit taking the loads to the water; the loads are not unbound until the journey is completed. The basic unit for floating is the bundle, which is formed from several loads. Recommendations, based on experience with this method, include winter bundling for timber transported by rail; making bigger bundles to increase draught; making up bundles on an inclined plane; and various designs of raft.

1838. ŽITIN, N. P., et al. Ploty dlja krupnyh vodohranilišč. [Rafts for large reservoirs.] *Lesn. Prom.* 1956 (4), (21-7). [Russ.]

Presents the results of investigations made by the Soviet Central Institute of Scientific Research on Timber Floating to find the best type of log raft for large artificial reservoirs, up to 600 km. long and 60 km. wide, in which waves attain a height of 2 m. at a wind force of 5-6. It was found that the stress imposed on the bundle bindings (viz. the stress while

floating freely on calm water, plus the stress due to pitching and rolling on waves) has, for the same bundle weight, different values for different bundle types and different cross-diameter ratios. It increases as that ratio increases from 1.5 to 2.5, except for single bundles on calm water, when it decreases as the diameter ratio increases. Three types of raft were tested: (1) with a single-row surround of boom sticks, and steel cables along this surround; (2) flanked with rigidly paired bundles (CNII-lesosplava 3) [cf. *F.A.* 17 No. 1672] attached to a similar surround; and (3) as (2), but bundles paired by means of transverse cables made taut by vertical braces. All three types proved superior to other types of raft in stability, and not inferior as regards material and labour costs.

1839. POPOV, A. I. Podgotovka listvennoj drevesiny k splavu. [Preparing broadleaved timber for floating.] *Lesn. Prom.* 1956 (3), (5-7). 1 ref. [Russ.]

Trial floatings of end-coated pulpwood logs of broadleaved species conducted in 1953-54 on different rivers in the U.S.S.R., showed that, even under the most unfavourable conditions for floating, end coating reduced the financial losses through sinkage of winter-felled logs to 2.5-13% compared with 17.5-30% for controls. Further reduction of losses can be obtained by air seasoning combined with patch-barking. Results of tests in Oct. 1954 on 3300 Birch pulpwood logs, felled in spring and summer of the same year and patch-barked, showed that, when stored in regular stacks, high-grade timber suffered incipient decay and mottled rot and had therefore to be downgraded. In concurrent tests with 370 cu.m. of Birch pulpwood logs felled from March to August and stacked in different sets of conditions until October, it was found that end-coated logs in bulk stacks under shade were 50-66% less susceptible to incipient decay than logs without end coating, stored in regular stacks without shade. End coating prevented mottled rot and discoloration. The incipient decay never sets in before June. Maintenance of timber grade was best achieved with logs totally coated and closely stacked under shade, which even yielded a certain amount of top-grade veneer. Other tests were carried out with 5-m. Birch logs subjected to 'sour felling'; they were logged in spring and summer 1954 and stored until spring 1955 on floating dumps in open aligned stacks. After prolonged floating (45 days loose, followed by 85 days in rafts) they were peeled, and the veneer was found to be of good grade, despite some incipient decay at both ends. These logs had a relatively low density thus ensuring a very small sinkage %.

1840. KOŽANOV, D. I. Konsol'nyj uskoritel' dlja podači lesa k glavnym vorotam zapani. [A propelling device for moving logs to the main gate of the terminal boom.] *Lesn. Prom.* 1956 (3), (8-9). [Russ.]

[Cf. *F.A.* 17 No. 1676.] Embodies a conical drum (length 145 cm., diameters 40 and 20 cm. at the wider and narrower end, respectively) with spikes. It is used for moving straggler logs pressed



against the lateral directing booms of the 'funnel'. Power of the driving motor, 2.8 KW; drum speed, 71.6 rev./min.

1841. TARASOV, V. M. Bašennyj kran na pogruzke i vygruzke lesomaterialov. [A tower crane used for the loading and unloading of timber.] *Lesn. Prom.* 1955 (12), (19–20). [Russ.]

Describes the performance of the BKSМ-14р tower crane-loader used on one of the Siberian waterways to unload timber from barges. The complete operational cycle of the loader is slightly below 3 min. It is self-propelled, with a 360° swing, a boom extending from 3.5 to 30 m., and a maximum lifting capacity of 5 tons.

1842. SERGUTIN, V. E. Rjaževye i kamenno-hvorostjanye lesonapravljaščie damby na gornyh rekah. [Cribwork and stone/brushwood dams for timber diversion on mountain rivers.] *Lesn. Prom.* 1956 (2), (19–23). 2 refs. [Russ.]

Dams are frequently used in Siberia for diverting floated timber in mountain rivers, the main types being: light cribwork, solid [heavy?] cribwork, stone/brushwood, and shingle/brushwood dams. According to the experience of the Krasnoyarsk timber-floating bureau, the stone/brushwood dams are the cheapest, most stable and most efficient. Comparative costs of material and labour for the construction of the cribwork and stone/brushwood dams, and data on the condition of the cribwork, stone/ and shingle/brushwood dams in the Krasnoyarsk province are tabulated. The design and methods of construction of stone/brushwood dams are described in some detail.

### 38. Forest Engineering

#### 383. Roads and Bridges

See also Nos. 1812, 2196.

1843. ROTH, C. Neuzeitliche Methoden des Waldwegebaus. [Modern methods of forest road construction.] *Schweiz. Z. Forstw.* 108 (9), 1957 (505–19). 7 refs. [G.f.]

Discusses various roadbeds, including costs, surfaces, equipment etc., particularly the use of compacted courses of gravel and sand, regarding which some results of static and rolling tests are presented, indicating that their bearing strength is greater than that of metalled roads with layers of similar thickness. For small-scale projects they may be preferable to stabilized earth roads, which need detailed soil analyses, specially trained soil engineers and particularly heavy equipment, so that their low costs per m. become effective only if lengths exceeding 1 km. are constructed. Equipment discussed includes 'traxcavators', angle-dozers, 'sheepsfoot' rollers, vibrating rollers and plate compactors.

1844. [Construction of forest roads in W. Germany.] *Allg. Forstzeitschr.* 11 (31/32), 1956 (393–416). 7 refs. [G.]

A special number, including: Stabilization and revegetation of unstable soils (*E. Kirwald*) [particularly of banks]; A modern way of metalling side roads

(*E. Rössner*) [using local sandstone and sand]; Track and rut techniques in forest road building (*G. Mantel*) [including concrete tracks, stressing low costs and frost resistance], and articles on concrete roads by *W. Müller* and *Strehlke*.

1845. GREISS, G. Maschinen und Geräte für das Verfahren der Bodenstabilisierung beim Forstwegebau. [Machines and equipment for building forest roads of stabilized earth.] *Forstarchiv* 28 (10), 1957 (197–202). 15 refs. [G.]

Reviews generally the operations involved and the machines required for making such roads, including motor graders and implements for compacting. Some illustrations and technical details are given.

1846. BACKMUND, F. Das Verfahren der Bodenstabilisierung und seine Anwendung im Waldstrassenbau. [The use of soil stabilization in forest road construction.] *Mitt. St. Forstverw. Bayerns* 29, 1957 (213–25). 8 refs. [G.]

Describes methods and equipment and gives some data on German costs, which vary from 6 to 25 DM/m. against 35–60 DM. for traditional methods.

1847. KİŞİNSKİJ, M. I., and DARAGAN, L. D. Zimnie avtomobil'nye dorogi. [Winter lorry roads.] *Lesn. Prom.* 1955 (9), (4–7). [Russ.]

Single-track ice roads are more advantageous than snow roads. Details of the ice road, its dimensions for different lorries, its maintenance, and protection against snow-drifts are described.

#### 385. Drainage, Irrigation, Sedimentation. Water Supply

1848. HEIKURAINEN, L. Metsäojien syvyyden ja pintaleveyden muuttuminen sekä ojien kunnon säilyminen. [Changes in depth and top width of forest ditches and the maintenance of their repair.] *Repr. from Acta for. fenn.* 65 (5), 1957. pp. 45. 22 refs. [F.i.e.]

With a 3-page English summary.

1849. HEIKURAINEN, L. Metsäojien syvyys ja ojituksen tiheys. [Depth and spacing of forest ditches.] *Metsät. Aikak.* 1957 (6; 7/8), (188–91; 233–8). 18 refs. [F.i.e.]

Studies by different Finnish authors [cf. *F.A.* 17 Nos. 2555–6] show that even on drained bogs tree roots keep close to the soil surface; this suggests that an equal improvement in tree growth could be obtained from shallower ditches. The author has found that shallow ditches are no more difficult or expensive to maintain than deep ones, and recommends depths of 50–70 cm. (roughly those obtained with ploughs) rather than the previously used 70–120 cm. The spacing of 60–80 m. commonly used, is considered suitable for S. Finland, and a wider spacing for N. Finland and Lapland. *From author's summary.*

1850. SAMSET, I. Mekanisering av skoggröftingen en forutsetning for grøftarbeider i større stil. [Mechanization of forest drainage a prerequisite for large-scale drainage.] *Norsk Skogbr.* 3 (17), 1957 (443 ... 447). [Nor.]

The Lokomo plough [see *F.A.* 18 No. 526] has been successfully used in trials in Norway, even on

difficult ground with stones and stumps. It weighs 3·8 tons and is used in Finland with a 12-ton crawler tractor; this proved unsuitable for wet Norwegian bogs and was replaced by a 6-ton tractor with wooden boards screwed to the tracks to give a track width of 85 cm. A winch with a pull of 15 tons was used and, in view of the light weight of the tractor, special anchoring equipment. About 1500 m. of ditches were constructed per day, a rate maintained for 5 weeks. How economic the

plough will be in Norway has not yet been established. Its use should reduce drainage costs but the cost of moving the machinery from place to place would be high, and the method is likely to be too expensive where a number of small separate areas are to be drained.

### 386. Waterways. Stream Training

See No. 1842.

## 4. FOREST INJURIES AND PROTECTION

See also Nos. 1456, 2611.

### 41. General Technique of Forest Protection. Types of Injury

See also No. 1279.

1851. WHITE, T. C. R. **Forest biology survey in New Zealand.** *N.Z. Timb. J.* 4 (3), 1957 (38–40).

Outlines the planning and inauguration and future development of this survey (1954–57), modelled on that of the Forest Biology Division, Canada. Objects are to keep a standing watch through local observers on insects and fungi injuring trees (particularly exotics), to discover the inter-relations, and to detect epidemics early, for eventual prevention or control. Records are kept and biology studied at the laboratory, Whakarewarewa.

### 42. Injuries from Inorganic Agencies other than Fire

See also Nos. 1457, 1614.

#### 421. Air Currents

See also Nos. 1319, 1450, 1726, 1736, 1799, 1800, 1858, 2066.

1852. MØLLER, C. M. Stormfaldets betydning for dansk skovbrug. [The importance of wind damage in Danish forestry.] *Dansk Skovforen. Tidsskr.* 42 (10), 1957 (526–43). [Dan.dan.]

Summarizes and tabulates data from the press on large-scale storm damage since 1894, and information from 26 forest districts on damage apart from the main storms. The total damage averaged over the 62 years comes to 50,000 cu.m. p.a. or 3% of the total amount felled. The figure for hardwoods was 0·3, for all softwoods 7·4 and for Norway Spruce alone 8%. The figure for conifers for the period 1894–1925 was 4·9 and for 1926–56, 8·5%. The greater part of this increase was due to the increased area carrying age classes > 45 years in 1926–56. Storms from the E. and from the W. are equally frequent, but the latter felled 50% more volume than the former. Saturated ground, snow or rain with the wind, root-rot and, for hardwoods, the presence of foliage, increased the windthrow, but saturated ground and root-rot reduced the amount of breakage. To reduce the threat to adjacent plantations immediately after felling, old Spruce should be felled in spring after storm damage is over or in early summer. *From author's summary.*

1853. MELZER, E. Verjüngungsschwerpunkte und Vorratspflege. [Regeneration foci and the care

of the growing stock.] *Forst u. Jagd* 7 (1), 1957 (6–8). 12 refs. [G.g.]

Observations on windthrow in the gales of 1955–56 in Spruce stands of the Western Erzgebirge, most of which had been overcut. Extent and type of damage varied with past treatment. Where regeneration foci of 20–40 areas had been formed in stands with poor crowns, mass windthrow starting from the gaps was severe. Where density had been reduced carefully, and crowns were larger, the foci did not suffer unduly.

1854. HIRATA, T., and MAEZEWA, K. [Wind damage in the Tokyo University forest, Hokkaido.] *Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (1–8). 19 refs. [Jap.jap.e.e.]

In assessing damage after typhoon No. 15, 1954, wind-firmness (% of undamaged stems) was found to be directly proportional to  $100^2/H\sqrt{N}$ , where  $H$  = mean height and  $N$  = trees/ha., a formula based on the statics of the bending moment and edge stress. Measures recommended to increase wind resistance are maintenance of broadleaved/conifer mixtures, keeping mean height low by crown thinning, frequent and moderate thinnings, and keeping the older age-classes at subnormal density.

1855. STEINBRENNER, E. C., and GESSEL, S. P. Windthrow along cutlines in relation to physiography on the McDonald tree farm. *For. Res. Note Weyerhaeuser Timb. Co.* Oct., 1956. pp. 19.

Windthrow along cutlines [the margins of clear-felled areas] was studied on several sites. It was negligible where the line was parallel to storm-wind direction. On lines at right angles to wind direction, it varied with topography, being most severe on the upper third of a lee slope but slight on windward slopes unless roots had been disturbed during logging.

1856. JOACHIM, H. F., and WACHTER, H. Über Sturm- und Windschäden an Pappeln. [Gale and wind damage to Poplars.] *Forst u. Jagd* 7 (10), 1957 (468–70). 2 refs. [G.]

Mainly observations after severe gales in 1956 and 1957 in E. Germany. Trees on sites with high water-tables, older or densely planted stands, and trees on the east sides of roads or watercourses suffered most severely. *Populus trichocarpa* had been thrown, and *P. × robusta* and *P. × berolinensis* broken, more easily than other Poplars, but differences were small.



1857. **Maple bleeding canker.** *Rep. Me. For. Comm.* 1955-56, 1957 (102-3).

Of a number of dead, dying, and unhealthy trees of *Acer saccharum* and *A. rubrum* near the coast of Maine in 1956, some were found to be affected by bleeding canker (*Phytophthora cactorum*) but others were not. In all cases bark was dead, usually on the S.E. or coastal side and it is considered probable that trees are suffering from the effects of the 1954 hurricane.

#### 422. Temperature Influences. Frost. Heat. Drought

See also Nos. 1469, 1867, 1958, 2005.

1858. PORTER, W. A. **Dieback of Douglas Fir.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (5), 1957 (3).

Damage to leaders and laterals of young Douglas Fir, sometimes associated with stem cankers and resinosis, are believed to be due to a period of severe cold with dry air and strong winds in Nov. 1955, suddenly terminating a previously moist, mild period.

1859. MIŠIĆ, V. Masovna pojava sekundarnog lišća bukve u Jugoslaviji. [**Large-scale secondary leaf-flushing of Beech in Yugoslavia.**] *Zborn. Rad. Inst. Ekol., Beograd* 6 (5), 1956. pp. 14. 12 refs. [Serb.e.]

In the subalpine Beech forests in many places a second flush of leaves appeared after heavy spring frosts in 1952 and 1953; morphological differences between leaves of the first and second flushes are commented on.

1860. MAGNANI, G. Danni da freddo sugli eucalitti nell'inverno 1955-56. [**Injury to Eucalypts [in Italy] from low temperatures in the winter of 1955-56.**] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (159-84 + 1 tbl., 16 photos). 10 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

The reaction to cold of young plants varied with species and site. In general, *E. dalrympleana*, *E. gunnii*, *E. niphophila*, *E. nitens*, *E. populnea*, *E. rubida*, *E. stellulata*, *E. bridgesiana* and *E. viminalis* showed fair to good resistance wherever observed. Damage to older trees was much less than to young ones, and none died.

1861. MALAISSE, F. Note sur la gélivure du chêne rouge d'Amérique en Campine. [**Note on frost-crack of *Quercus rubra* in Campine.**] *Bull. Soc. for. Belg.* 64 (10), 1957 (439-61). 9 refs. [F.]

A study of *Q. rubra* in this region of Belgium leads to the following conclusions: The trees most susceptible to frost-crack are isolated individuals, trees on the edge of stands, and standards in coppice-with-standards. Aspect is important, the most dangerous being S.E., S., and S.W. This species should be grown on good, moist soils, in mixed uneven-aged stands, with northerly aspects.

1862. IGMÁNDY, Z. Fagyrepedés okozta károk csereseinkben. [**Frost crack in *Quercus cerris***

**stands in Hungary.**] *Erdömérn. Föisk. Közl.* 1956 (2), (81-101). 13 refs. [Hu.hu.russ.g.]

Site factors and data on frost crack are given for 49 plots. The damage, invariably accompanied by false heart, is most frequent in stems of timber size, up to 34% of the volume per plot being found affected. Damage increases with diameter, not only by number of stems affected, but also in length of crack and volume of material damaged. Local climate as influenced by topographical factors is decisive. The worst sites are the valleys and level lowlands (especially moist and sodden sites), and the hill spurs running out into them. Ridges and upper slopes suffer least. On slopes, the amount of frost swelling depends on aspect, north and east being worst. Turkey Oak is distinctly more frost-tender than Pedunculate and Sessile on the same soils. In the worst areas, a change of species is recommended; in others an admixture of shade-tolerant accessory species for protection against frost, and the maintenance of a thick-walled forest edge against the dangerous winds.

1863. EICHBAUM, K. Über die Frostresistenz unserer Wirtschaftspappeln. [**Frost-hardiness of our commercial Poplars.**] *Allg. Forstzeitschr.* 11 (27/28), 1956 (354-5). [G.]

Discusses observations made after the hard winters of 1954-55 and 1955-56, including frost cracks, chiefly of *Populus × robusta*, and discolorations of bark, stem and pith, most severe on 2-year-old nursery stock of *P. 'deltoides missouriensis'* and Italian cultivars. It was noted that plants which had been treated with fertilizer containing some boron remained sound, while others from the same clones in similar sites, but untreated, were injured. [Cf. F.A. 19 No. 1658.]

1864. MILLIKAN, C. R., and ANDERSON, R. D. **Dead-top of *Pinus* spp. in Victorian plantations.** *Aust. For.* 21 (1), 1957 (4-14 + 5 photos). 10 refs.

Field surveys of several Forests Commission Pine plantations revealed the presence of dead-top in some areas. The evidence suggested that the disorder was associated with moisture stress during hot, dry summer months in *Pinus* spp. growing on shallow soils with a high tree density. Affected sites usually had exposed northern or westerly aspects. The first symptoms appeared in late summer or early autumn. Experimental work in the glasshouse, designed to simulate closely field moisture-stress conditions during the hot summer months, has reproduced the dead-top condition in young trees of *P. radiata* and demonstrated tree recovery when the moisture stress was relieved by watering. Similar conditions of moisture stress during the winter produced a general wilting and dying of the trees instead of dead-top symptoms. Results suggest that, under field conditions, a reduction of tree population would alleviate the trouble. A plantation at Beechworth severely affected with dead-top was heavily thinned in 1951 and has since shown no evidence of the disorder. No primary association between the fungus *Diplodia pinea* and dead-top was established in a pathogenicity test using *P. radiata* as the host plant. *Author's summary.*

**423. Precipitations**

See also Nos. 1319, 1696.

1865. BENJAMIN, D. M. Hail damage to five-year-old Red Pine in Northern Wisconsin. *For. Sci.* 3 (3), 1957 (249–52). 3 refs.

This damage is distinguished from that caused by *Aphrophora saratogensis*. After a severe storm the *P. resinosa* showed 4, 78 and 65% tree, terminal bud and lateral bud mortality respectively and 33% of leading and 65% of lateral shoots destroyed. An infestation, which later subsided, of unidentified lepidopterous and coleopterous larvae affected 5% of the stems. Crooks in butt logs are feared.

**424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.**

See also Nos. 1305, 1611, 1720, 1863.

1866. AHLGREN, C. E., and HANSEN, H. L. Some effects of temporary flooding on coniferous trees. *J. For.* 55 (9), 1957 (647–50). 4 refs.

Observations were made in 1950–51 on the effect of different periods of flooding on the terminal growth, crown recovery and survival of 6 conifer species in two Minnesota areas. Balsam Fir and Black Spruce were most flood resistant, showing best survival and crown recovery and the smallest reduction in terminal growth for > 48 days' submersion. All species were killed by > 48 days' submersion. Observations in other areas indicate that Balsam Fir is less tolerant of flooding than most of the associated hardwoods.

1867. Red Pine death. *Rep. Me. For. Comm.* 1955–56, 1957 (104).

Mortality in a plantation of *Pinus resinosa* was thought to be due to a 'ledge' effect causing extreme drought. Excavation of the root systems of two living trees within a group of dead trees, showed in each case a fissure in the rock ledge under the living tree. The soil in and round dead groups was sounded, and in all cases found to be shallow, gradually deepening towards the living areas. Secondary barkbeetle attack occurred in affected areas.

1868. BROESHART, H. The application of foliar analysis to Oil Palm cultivation—IV. The diagnosis of multiple deficiencies. *Trop. Agriculture, Trin.* 34 (4), 1957 (269–76). 11 refs.

Plants from direct sowings in sand showed that a check analysis of leaves was required to diagnose deficiencies, visual symptoms of one deficiency being possibly masked by those of the second. The level of a deficient element in the leaf was very little influenced by other deficiencies, antagonisms generally occurring with another, non-deficient element. Characteristic changes in leaf composition are given for K + Mg, K + P, and P + Mg deficiency, the most frequent in the Belgian Congo; also deficiency symptoms for S and for K and for an abnormal condition associated with K deficiency. [Cf. *F.A.* 19 No. 40.]

1869. HOLSTENER-JØRGENSEN, H., and KLUBIEN, E. Diagnostisering af kvælstoffmangel i bøgekulturer. [Diagnosis of N deficiency in Beech

plantations.] *Dansk Skovforen. Tidsskr.* 42 (11), 1957 (593–600). 4 refs. [Dan.]

Trials were made in 1956 in 2 plots established (1) in 1955 and (2) in 1951. Sample leaves, dark, medium and light green according to Munsell's Color Charts for plant tissues, were selected, in (1), and green and light green in (2). Pairs of neighbouring trees were sought, each showing a leaf colour corresponding with one of the sample leaves, one leaf was taken from each, and leaves of the same colour were analysed for their N content. Colour and N were found to be related, values ranging from 2.19% N in dark green to 1.49 and 1.46% in light green leaves from (1) and (2) respectively. All values are below the optimum according to data for *Fagus grandifolia* from Mitchell and Chandler [see *F.A.* 1 pp. 251–2]. Measurements in Aug. 1956 in (1) on neighbouring dark or light green plants that had been the same size in the spring showed top shoot lengths of 30.4 and 16.2 cm. respectively. Fertilizers containing N, P, and K together or separately had been applied to (1). The mean numbers of dark plants in blocks given N, N + P, N + P + K, or N + K were 66, 70, 70 and 65 respectively and on those given P, P + K or K and on control plots 40, 44, 47 and 45. It is concluded that light colour in the leaf is an indicator of N deficiency in Beech.

1870. VAIL, J. W., CALTON, W. E., and STRANG, R. M. Dieback of Wattle—a boron deficiency. *E. Afr. agric. J.* 23 (2), 1957 (100–3). 5 refs.

On the deep, intensely leached, red earths (sesquioxide-kaolinite type) of the Wattle plantations at Njombe, Tanganyika, this dieback may, in patches, affect > 90% of the stems, 40% of which may recover, though the incidence over thousands of acres is probably only 0.1%. Trees are mainly affected in their second, a few in the first and third dry seasons, the condition being conspicuous at the middle of the dry period and dwindling with the following rains. Composite leaf samples from affected areas, (a) apparently healthy, (b) with dieback, and also from non-affected areas (c) healthy, showed B contents in p.p.m. of 11.2, 7.2 and 20.4 respectively. Spraying with various combinations of Ca, S, P, Mo, B, and Zn, some superposed on soil applications of Ca, P, and S, showed that B deficiency alone is probably responsible for the condition. Two sprayings of B (0.25% borax in water at 7 lb. borax/acre) should cure the condition and if the first spraying is timely the second may prove unnecessary. A similar cause of dieback is now suspected in *Pinus patula*, *P. radiata*, *Eucalyptus* spp. and *Grevillea robusta* in the same province.

**425. Chemical Influences (Atmospheric)**

See also Nos. 1350, 1720.

1871. BLEASDALE, J. K. A. Smoke pollution and the growth of plants. *Herb. Abstr.* 27 (3), 1957 (161–5). 48 refs.

A review of literature on the effects of coal smoke pollution on the growth of herbage.

1872. ZIEGER, E. Die Wirkung der Industrie-Rauchschäden auf den Wald, ihre Berücksichtigung



bei der Raumplanung und die Notwendigkeit ihrer gesetzlichen Regelung. [Forest injuries through industrial smoke, their consideration in land-use planning and the need for legislation.] Repr. from *Wissenschaftliche Zeitschrift der Technischen Hochschule, Dresden* 6 (4), 1957 (777-87). 14 refs.

Reviews the history of the problem, its extent in E. Germany, data on the injurious emissions of various industries and of different fuels, with examples of the range of injurious effects of individual works, existing methods of reducing emission of solid particles and gases (those for gases being still highly unsatisfactory) and legislation to regulate air pollution in many countries. The siting of industries should, if possible, avoid endangering forest or agricultural areas; as this involves the industrial use of waste land or poorer sites (e.g. for atomic stations) afforestation plans for such areas need to be well co-ordinated with industrial planning in order to avoid disappointment and waste.

1873. ZIEGER, E. Die gesetzliche Regelung forstlicher Rauchschäden im In- und Ausland. [The law on smoke damage to forest in Germany and other countries.] *Forst u. Jagd* 7 (8), 1957 (369-71). [G.g.]

Discusses the development and present state of the law regarding air pollution, including damages, tolerance standards, clean-air acts etc. in Germany, U.S.A., England, France, the Netherlands, Czechoslovakia and Russia. While most countries limit permissible emission of smoke particles, standardization of permissible  $\text{SO}_2$  content is less advanced because more difficult, and no industrially applicable  $\text{SO}_2$  filter has yet been developed.

1874. ABRAMAŠVILI, G. G. Action of atmospheric impurities on coniferous plantings. *Gigiena i Sanitarija, Moskva* 22 (4), 1957 (67-9). [Russ.] From abstr. in *Chem. Abstr.* 51 (20), 1957 (15715). P.R.

The needles of conifers collect S from the air, the uptake rising with increasing S content of the air. Trees are damaged when aerosols contain  $> 0.2$  mg./cu.m. of  $\text{SO}_3$ ; the needles become discoloured and their life is shortened. It is suggested that such plantations would contribute to the purity of city air.

1875. MÜLLER, J. Spezifischer Nachweis von  $\text{SO}_2$  Rauchschäden an Pflanzen mit Hilfe von Blattpigmentanalysen. [Specific proof of  $\text{SO}_2$  fume damage to plants by means of leaf-pigment analyses.] *Naturwissenschaften* 44 (16), 1957 (453). 3 refs. [G.] O.R.S.

Examination of damaged needles of 2-year-old grafts of *Abies alba*, exposed to a mixture of 1.5 mg.  $\text{SO}_2$  per cu.m. air, showed that chlorophyll *a* was broken down more rapidly than chlorophyll *b*, whereas in needles exposed to artificial drought or freezing the two chlorophyll components broke down at the same rate. Spruce needles exposed to smoke also showed a more rapid breakdown of chlorophyll *a*. The method, which is described, can be used to distinguish smoke damage from damage by drought or frost.

#### 429. Other Injuries due to Inorganic Agencies

1876. SHIDEI, T., OKADA, S., and YOSHIKAWA, K. [Radio-active contamination of seedlings in the open.] *J. Jap. For. Soc.* 39 (5), 1957 (183-4). [Jap.]

During a period of radio-active rain in Kyoto, a few plants each of *Cryptomeria japonica* (1-year seedlings), *Metasequoia glyptostroboides* (2-year rooted cuttings) and 'Urinoki' (2-year seedlings) were enveloped in polythene bags from early June to early Dec. 1956, so as to shield them. They and adjacent controls (unprotected) were then carefully dug out, washed, weighed green and oven-dry, then ashed in an electric furnace and their radio-activity assessed by a C.M. counter (Kobi Manufacturing Co.). The protected stock had no abnormal radio-activity; of the exposed stock, the *Cryptomeria* showed ca. 20 units/min./g. dry weight above normal, the *Metasequoia*, whose leaves, stem and root were ashed and assessed separately, showed ca. 14 counts above normal for the leaves and no significantly abnormal counts for stem and root, while *Urinoki*, whose leaves alone were tested, showed ca. 12 counts above normal. The mean for all species together showed increased radio-activity of 10-15 counts/min./g. dry weight, practically all of which was registered from the foliage.

#### 43. Forest Fires

See also No. 1611.

1877. [Forest fire research conference, New Brunswick, August 1957.] *Pulp Paper Mag. Can.* 58 (11), 1957 (181...240). 6 refs.

Contains the following conference papers, dealing with fire control in N. America: Keep the fire small (E. T. Owens); Research in forest-fire control—1957 (J. C. MacLeod); A bird's eye view of forest-fire research in the United States (C. C. Wilson); Aerial suppression equipment and techniques (L. Affleck); Ground (forest-fire) suppression equipment and techniques (G. L. Miller).

#### 431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

1878. CRAMER, O. P. Test of wind predictions for peak fire-danger stations in Oregon and Washington. *Res. Pap. Pacif. Northwest. For. Range Exp. Sta.* No. 22, 1957. pp. 41. 3 refs.

The relative accuracy of several methods of forecasting wind speed was tested during the forest-fire seasons of 1950-51. Three fire-weather forecast centres of the U.S. Weather Bureau prepared individual station forecasts for 11 peak stations in the Oregon and Washington national forests, which were compared with routine area forecasts, forecasting aids suggested by fire-protection agencies, and also with some statistical forecasts (usually applied to check accuracy of methods). The accuracy of the methods tested varied significantly between stations, no one method being best for all. Station forecasts issued in the morning on the wind speed for 4.30 p.m. were no more accurate than those issued the previous evening. All methods showed least accuracy on the more important days. Some forecasting aids that showed promise for

certain stations are recommended for trial where wind is important. Otherwise it is recommended that fire-control agencies rely on good observation and quick reporting of important winds. *From author's summary.*

1879. **Hazard rod moisture studies.** *Rep. For. Timb. Bur. Aust. 1956, 1957 (21).*

Continuous 3-hourly readings of fuel-moisture sticks were taken throughout the day and night at 3 stations. Overnight gain in m.c. appears to be directly related to overnight relative humidity, and the inclusion of this factor in fire-danger tables may be warranted. Studies were also made on the effect of wood density on daily minimum m.c. of *Pinus radiata* sticks. Indications are that sticks of low density reach a considerably lower m.c. than those of medium or high density. This points to the need for fuel-moisture sticks being manufactured from timber of fairly constant density.

1880. **Fire-behaviour studies.** *Rep. For. Timb. Bur. Aust. 1956, 1957 (21).*

Microstudies of fire behaviour and rate of spread of fires burning in small 10 × 20 ft. plots of *Pinus radiata* needles were continued, and confirmed that rate of spread, for a given fuel moisture content and fuel type, varies, for all practical purposes, as the square of wind velocity. Studies are to be extended to rate of spread of large-scale, free-burning fires.

1881. SMALL, R. T. **Relationship of weather factors to rate of spread of the Robie Creek fire.** *Fire Control Notes* 18 (4), 1957 (143–50).

Weather conditions and fire behaviour are analysed. The fire exhibited 4 different types of behaviour during 5 days. On 4 of the days, behaviour was as expected, but on the 3rd day (meteorologically similar to the 2nd day) it was different and unexpected. Implications for forecasting and research are pointed out.

#### 432. Prevention and Control

See also Nos. 1761, 1888.

1882. STEIGER, A. J. **Russians find new way to fight forest fire with fireproof underbrush.** *Forests & People, Alexandria, La. 1957 (3), (17, 46–7).*

The substance of an article in *Lesn. Prom.* [no date given] on the use of a perennial shrub 'Sakhalin wild buckwheat' [*Polygonum sachalinense?*] in the U.S.S.R. for living firebreaks. Leaves and foliage contain 82% moisture; the plant grows 7–14 ft. high during a summer and can withstand frosts reaching –40° C. Tests in Sakhalin of its fire-resistant properties indicated that thickets are a completely effective barrier against low forest fires and can be recommended for planting in firebreaks. Instructions for planting are given.

1883. **Chemical control of Eucalypt vegetation along firebreaks.** *Rep. For. Timb. Bur. Aust. 1956, 1957 (21–2).*

Experiments in chemical control of 2½-year-old regrowth of *Eucalyptus rossii*, *E. stuartiana*, and *E. macrorrhyncha*, indicated that spraying with Ammate, even at concentrations as low as 50 lb. (100 gal.)/acre gave 50–80% kill.

1884. GILL, E. D. **The selection and development of fire fighting equipment** [in Victoria, Australia]. *Misc. Publ. For. Comm. Vict.* No. 6, 1957. pp. 17. (Seventh British Forestry Conference, Australia and New Zealand, 1957.)

1885. BANKS, W. G., and FENTON, R. H. **Primacord tested for blasting fireline.** *Fire Control Notes* 18 (4), 1957 (164–7).

Experiments with Primacord, a type of detonating fuse consisting of an explosive core of pentaerythritol-tetranitrate in a waterproof textile or plastic cover, indicated that it has no practical application in fire-control work. It was not very efficient at clearing a fire-line, and was apt to start fires.

#### 435. Benefits of Fire Control. Injurious Effects of Fire

See also Nos. 1287, 1294, 1588, 2063.

1886. BARTLETT, H. H. **Fire in relation to primitive agriculture and grazing in the tropics: annotated bibliography.** Vol. II. Department of Botany, University of Michigan, Ann Arbor. 1957. pp. 873.

[Cf. *F.A.* 17 No. 2927.] References are arranged alphabetically under authors; a geographical subdivision was introduced after the volume was begun, and whereas references under A–G deal with the whole of the tropics, H–J cover only S. Asia and Oceania. Vol. III will be restricted to tropical Asia and the Pacific, and IV and V to Africa and the Americas respectively.

1887. GUILLOTEAU, J. **The problem of bush fires and burns in land development and soil conservation in Africa south of the Sahara.** *Sols Africains, Paris* 4 (2), 1957 (64–102). 49 refs. [E.F.]

Reviews, in a study of fundamental factors, the findings of African soil, pasture and forest conferences, before recommending (in a second part to be published) the probably conflicting methods of bush-fire control suitable for (a) water conservation, (b) forest-production and (c) pasture management.

#### 436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 1620, 1886.

1888. WEAVER, H. **Effects of prescribed burning in second growth Ponderosa Pine.** *J. For.* 55 (11), 1957 (823–6).

On the Klamath Indian Reservation, S. Oregon, fire hazard has been greatly reduced in a dense even-aged pole stand by prescribed burning started in 1939 and continued annually. Part of the treated ground now has a cover of the native grass *Festuca idahoensis* instead of the formerly dominant bitterbrush (*Purshia tridentata*).

#### 44. Damage by Harmful Plants. Virus Diseases

##### 441. Weeds

See also Nos. 1312, 1494, 1714–7, 1745–8, 1883, 2605.

1889. LEMAISTRE, J. *La lutte contre l'Imperata.*



[Control of *I. cylindrica*.] *Fruits, Paris* 11 (9), 1956 (380-3). 7 refs. [F.] E.M.B.

A general discussion, based on a study of the literature, of the suppression of *I. cylindrica* by mechanical and chemical methods and by cultivation of competing plants. No really satisfactory treatment has yet been found.

1890. VLASZATY, Ö. Az erdőgazdasági vegyszeres gyomirtási kísérletek eddigi eredményei. [Preliminary results of experiments on chemical weed control in forestry.] *Erdész. Kutatás., Budapest* 1957 (1/2), (95-112). [Hu.hu.russ.e.g.]

Tests of 14 substances for the killing of *Asclepias syriaca*, *Agropyron repens*, and *Calamagrostis epigeios*. Against the first two species, 100% success was got with NaClO<sub>3</sub> but *A. repens* required soil preparation. Work on *Calamagrostis* continues.

1891. OLBERG, R. Untersuchungen über die Biologie und die Bekämpfung des Adlerfarns im nördlichen Schwarzwald. [Investigations on biology and control of bracken in the Northern Black Forest.] *Allg. Forstzeitschr.* 11 (20), 1956 (264-7). 19 refs. [G.g.]

In small-scale but varied trials, with 10 growth regulators, 4-CP [CPA] and MCPB showed promise. Chlorates (pure NaClO<sub>3</sub> or proprietary) and Usil (an As preparation) were also effective. Mineral oils and overdoses of 'Ruhrkalkammoniak' (5-20 kg./100 sq. m.) promoted growth. Research continues.

1892. Chemische onkruidbestrijding. [Chemical weed control.] *Korte Meded. Bosbouwproefsta., T.N.O., Wageningen* No. 30, 1957 (11). [Du.]

*Molinia caerulea* was controlled successfully by TCA at 100-150 kg./ha., May being the worst and August and September the best months for application. *Deschampsia flexuosa* was controlled by TCA and dichloropropionic acid ester (d.a.e.). The latter was 3 times as effective as TCA and 3 times as expensive. In April-May, 100 kg. TCA/ha., gave a complete kill, but was less effective at other periods; TCA could not be used in autumn and winter. *Vaccinium myrtillus*, *Quercus borealis* and *Prunus serotina* were completely killed by 2,4,5-T ester applied as a spray (5-7 litres/ha.) in June-July. Tests on *Pteridium aquilinum* are not complete but spraying with d.a.e. and 'Ugex' gave promising results.

1893. RÖHRIG, E. Anwendungsmöglichkeiten chemischer Unkrautbekämpfungsmittel in der Forstwirtschaft. [Chemical herbicides in forestry.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 85, 1956 (201-4). [G.]

A general discussion of German experiences with (1) TCA, (2) CMU, (3) 2,4-D and 2,4,5-T, (4) dalapon and (5) CIPC. Of these, (1) and (2) had sometimes severely damaged the stand, (1) at 50 kg./ha. in one instance killing 100-year-old Pine; (3), useful against *Vaccinium* and *Calluna* on less acid sites, often led to heavier grass infestation; (4) held promise if used before planting, but no successful chemical weed control in plantations appeared possible as yet.

1894. BURSCHER, P. Untersuchungen über die Wirkungsweise von Chlor-IPC. [The mode of action of CIPC.] *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 20, 1955 (353-8). [G.g.] C.G.B.

Briefly describes field and pot tests with Pine and Spruce seed and seedlings, and with different soils. While 0.5 litre CIPC/ha. [concentration not given], applied immediately after sowing, caused lethal injuries to all seedlings, 12 litres/ha. applied 4 weeks after emergence, and 32 litres/ha. applied to 1- to 3-year-old seedlings, caused no visible injuries, only a slight growth retardation in Pine. Pot tests with Oak seedlings indicated that the herbicidal effect was greatest and most lasting in loamy soils. In humus soils, CIPC fairly soon lost its effectiveness, presumably through the action of micro-organisms, and in sandy soils it was quickly washed out. No effect on the respiration of soil micro-organisms was observed. CIPC added at a rate corresponding to 2 litres/ha. to a nutrient solution in which *Agrostis vulgaris* was grown in the laboratory, killed this perennial weed, suggesting that with suitable forms of application it might be made effective against perennial weeds in the field also.

1895. LINDEN, G. Die Unkrautbekämpfung mit CIPC unter deutschen Verhältnissen. [CIPC as a weedkiller under German conditions.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 85, 1956 (198-200) [G.]

In trials at Ingelheim on the Rhine, over-all spraying of plots of conifers and hardwoods with dosages of 5-7 kg. active substance/ha. caused no injuries to the previous year's transplants if done before shoot development, but recently transplanted conifers suffered considerably. Similar treatment during the growing season, particularly in May and June, seriously damaged 1- to 3-year-old transplants, except Sycamore Maple. Using the spray only between the rows was promising, no visible injuries resulting, even on current year's transplants during the lammas-shoot period. Ca. 50% of Poplar cuttings sprayed between rows in spring suffered growth checks. Stools and 1-year-old rooted plants showed no ill effects after treatments from June to August. Weed control lasted 3-4 months; it was greatly reduced by hot and dry weather at the time of spraying. In dry weather, results were better on heavy soils; in wet, on sandy sites.

1896. FROMANTIN, J. Influence du 2,4,5-T et de l'A.I.A. sur la morphologie et l'anatomie des plantules de cinq espèces de conifères. [The influence of 2,4,5-T and IAA on the morphology and anatomy of seedlings of five coniferous species.] *Rev. gén. Bot.* No. 760, 1957 (279-98). 12 refs. [F.] O.B.D.

Seeds of *Pinus pinea*, *P. sylvestris*, *P. excelsa*, *Thuja orientalis* and *Cupressus macrocarpa* were germinated in the presence of different concentrations of 2,4,5-T and IAA and modifications observed in the seedlings. In addition to inhibiting growth of the hypocotyl and the roots, 2,4,5-T also caused swelling of these organs; the cotyledons showed

practically no modifications in size, except in the case of *T. orientalis*, where they were significantly enlarged. The IAA treatments produced only slight modifications in the roots and hypocotyls. In the hypocotyls and roots of all the species tested, and in the cotyledons of *T. orientalis*, the parenchyma cells responded to most of the 2,4,5-T treatments by an increase in size, while the cells of the vascular and secretory systems remained unchanged.

1897. McCULLY, W. G. **The use of granular herbicides for brush control.** [Paper] *Fifth Annual Texas Agricultural Aviation Conference* 1957. pp. 5. From *abstr. in Weed Abstr.* 6 (6), 1956 (807). O.R.E.

Discusses the aerial application of herbicides in granular and pelleted form to brush. Indications were that granular urea offered less hazard from aerial drift than the phenoxy herbicides but those that include small particles can be expected to have the same drift risks as liquid sprays. Fenuron applied at 2-4 lb./acre in pelleted or granular form seems to be as effective as 4-6 lb./acre of monuron.

1898. ELWELL, H. M. **Injector method for tree and brush control.** *Proc. 13th Nth. Cent. Weed Control Conf.* 1956 (68-9). From *abstr. in Weed Abstr.* 6 (9), 1957 (1359). O.R.E.

Describes the 'Little Tree Injector' and compares injection with basal treatments for tree and brush control. In tests described, and from observation, total costs for the two methods were about equal when treating small brush, but for trees > 4 in. in diam., injection was about a quarter to half as expensive. In tests for the control of Oak trees and brush, low-volatile 2,4,5-T (propylene glycol butyl ester) 1 lb. in 4-75 gal. diesel oil gave 92-5% control by injection and 81-2% control with basal bark treatment and was more effective than a 50/50 mixture of 2,4-D and 2,4,5-T either at 1 lb. in 4-75 gal. diesel oil or at 2 lb. in 4-5 gal. diesel oil. When the rate of low-volatile 2,4,5-T ester was increased to 2 lb. the results were not better by injection and only slightly better when applied by basal bark treatment.

1899. WERNER, J. **Traitement des plantes aux hormones.** [Growth regulators as weed- and brush-killers.] *Forêt, Neuchâtel* 11 (1), 1957 (7-11). [F.]

Describes results obtained with commercial brush-killers based on growth regulators [not named] on the pastures and woodlands of the Jura, difficulties of timing, need for repetition etc. The author considers that great caution is necessary for their use in the forest, which should be restricted to the eradication of brambles and to the reclamation of clear-felled areas, because the young shoots of most forest trees, even those classed as resistant, are injured by these preparations, with deformation of stem and crown.

1900. RAY, H. **New developments in chemical brush control in Arkansas.** *Journal of Range Management, Portland* 10 (4), 1957 (151, 155). From *abstr. in Weed Abstr.* 6 (9), 1957 (1364). O.R.E.

Brush control by aerial and ground application is fully discussed with two tables giving recommended treatments for different species using (1) foliar and (2) basal application.

1901. BENNETT, J. M. **Chemical control of conifers on utility right-of-way.** *Proc. 11th Ntheast. Weed Control Conf.* 1957 (329-35). From *abstr. in Weed Abstr.* 6 (7), 1957 (1021). O.R.E.

The most effective of a number of herbicides tested for the control of *Abies balsamea* and *Picea mariana* were monuron 3-4 lb., 2,3,6-TBA 4-6 lb., 2,4,5-TP 6-8 lb., TCA 8-10 lb., dalapon 15-20 lb., all per 100 gal. TCA and 2,3,6-TBA were considered the most suitable materials for extensive use. Unless applied in oil, the chemicals were not effective in April or October. It is thought that the time of highest susceptibility is the same as for deciduous species. NH<sub>4</sub> sulphamate, amino triazole, NaClO<sub>3</sub>, 2,4-D plus 2,4,5-T, and erbon were not very effective. 4-CPA, MCPP and 2,4-DP at 10 lb. were ineffective when applied in October. Waste transformer oil gave 95% kill in April and 100% in October.

1902. PLAYFAIR, L. [Editor]. **Control of woody plants (4 abstracts).** *Res. Rep. West. Sect. nat. Weed Comm. Can.* 1956 (81-2). From *abstr. in Weed Abstr.* 6 (5), 1957 (563). O.R.E.

Monuron at 3 oz./100 sq. ft. and concentrated Borascu (89% anhydrous borax) at 9 lb./100 sq. ft. were applied to woody growth along a fence-line (chiefly Rose [*Rosa* sp.] and Snowberry [*Symphoricarpos* sp.]) after the vegetation had been cut to within 3 in. of ground level. Observations up to 18 months later showed Borascu to be much more effective on woody growth than monuron; the reverse was the case for herbaceous growth. 2,4,5-T, with or without 2,4-D, was applied to fence-row areas as follows: (1) 1-5 lb./acre 2,4-D plus 2 lb./acre 2,4,5-T (butoxy ethanol esters); (2) 2 lb. 2,4-D plus 1 lb. 2,4,5-T (butoxy ethanol esters); (3) 4 lb. 2,4,5-T; (4) 6 lb. 2,4,5-T. (1) and (2) were applied to an area containing Alder (*Alnus* spp.), Silver Poplar (*Populus* sp.), Blackberry (*Rubus laciniatus* and *R. procerus*) and Hawthorn (*Crataegus* sp.); (3) and (4) were applied to areas containing Hardhack (*Spiraea* sp.), Blackberry and Alder. Treatment (1) gave sporadic control; (2) excellent control of all species except Hawthorn; (3) and (4) excellent control of Blackberry but very little control of *Spiraea* sp. 2,3,6-TBA was applied at 2 and 4 lb./acre (1) in 15 and 30 gal. water as a foliage spray and (2) in 15 gal. diesel fuel oil as a dormant over-all spray. Effects were very slow to appear; after about 15 months White Poplar (*Populus* sp.) Ash (*Fraxinus* sp.), Hawthorn (*Crataegus* sp.), Willows (*Salix* sp.) and Wild Rose (*Rosa* sp.) were dead from treatment (1), Burr Oak (*Quercus macrocarpa*) developed some deformed leaves and other *Quercus* spp. were dying. Hazel (*Corylus* sp.) showed re-growth from roots; Dogwood (*Cornus* sp.) showed only slight effects. After 12 months, more or less similar results were showing on the same species from treatment (2).

1903. CARTER, M. C., and CHAPPELL, W. E. **The effect of carrier, formulation of phytocide, and time of treatment on the percentage kill of certain woody plants.** *Proc. 11th Ntheast. Weed Control Conf.* 1957 (209-18). 33 refs. From *abstr. in Weed Abstr.* 6 (7), 1957 (1023). O.R.E.

An experiment to compare the effect of date of



application (May, June, Aug. and Sept.), formulation (two commercial products, 2,4-D + 2,4,5-T each 2 lb./gal. with different kinds and amounts of solvents and emulsifiers) and water or oil carriers. All woody species except *Nyssa sylvatica* were most susceptible in May; *N. sylvatica* was best treated in June. September was the least successful month. There was no significant difference in effectiveness between oil and water carriers, nor between the two formulations.

1904. WORLEY, D. P., BRAMBLE, W. C., and BYRNES, W. R. Investigations of the use of 2,4,5-T esters as a basal spray in the control of Bear Oak. *Weeds* 5 (2), 1957 (121-32). 3 refs. From *abstr.* in *Weed Abstr.* 6 (6), 1957 (799). O.R.E.

Optimum kill of *Quercus ilicifolia* 3 years after application was obtained by completely spraying the basal portion, so that the herbicide reached the root collar, during early winter (Nov.-Jan.). Concentrations < 1.5-2% did not give consistent results, but above this there was little variation. The higher volume rates produced top kill more rapidly. [Cf. *F.A.* 14 No. 2234.]

1905. PRIDHAM, A. M. S. Response of Ash, *Fraxinus americana*, to amino triazole at the rate of 5-20 pounds per acre applied basally to trunks and as a foliar spray to seedlings and sprout growth. *Proc. 11th. Ntheast. Weed Control Conf.* 1957 (312-4). From *abstr.* in *Weed Abstr.* 6 (7), 1957 (1020). O.R.E.

Foliar sprays of amino triazole were much more effective in killing *F. americana* than basal treatments. Rates of 5 lb./acre killed or seriously injured stands of suckers in a cut-over area with stools 6 in. in diameter.

1906. WALKER, L. C. A new woody plant killer: chlorobenzoic acid. *Proceedings of the Association of Southern Agricultural Workers*, Raleigh 53, 1956 (154). From *abstr.* in *Weed Abstr.* 6 (5), 1957 (550). O.R.E.

2,3,6-TBA applied to frills and 'cups' on *Quercus alba* and *Q. borealis* was more effective than 2,4-D or 2,4,5-T. *Viburnum prunifolium* and *Prunus* spp. were killed and *Carya* spp. shed their bark. The effect on *Pinus taeda* was promising, and the top growth of *Lonicera* spp. was almost completely controlled. Basal sprays, soil injection, and mechanical tree injections have not proved satisfactory.

1907. PETERS, R. A. Observations on the effectiveness of polychlorobenzoic acid for pasture brush control. *Proc. 11th. Ntheast. Weed Control Conf.* 1957 (236-7). From *abstr.* in *Weed Abstr.* 6 (7), 1957 (1019). O.R.E.

Over-all foliar applications of polychlorobenzoic acid, 8 and 16 lb./100 gal. water, killed *Juniperus communis*, *J. virginiana* and *Pinus strobus*. *Equisetum* sp. was effectively controlled by 4 lb./100 gal., while bracken showed considerable dieback and no regrowth.

1908. PARRY, M. S. Note on herbicide trial carried out by the silviculturist, Lushoto. [Paper] *E.*

*African Herbicides Conference* 1957. pp. 2. From *abstr.* in *Weed Abstr.* 6 (6), 1957 (812). O.R.E.

*Rubus myrianthus* can be controlled by basal sprays of 10% 2,4-D if all the shoots are sprayed. Lower concentrations are effective against shoots up to ca. 15 ft. long. Na-arsenite solution applied to cut ends of shoots was effective in the shade though not in the open, but only if every shoot was treated. Spraying the bark with 4% 2,4,5-T, after removing the loose outer scales, killed 1 tree out of 4 of *Ocotea usambarensis*. Application of 10% Na arsenite to band girdles 1 ft. wide killed 5 trees out of 6, and the remaining one is sickly. Neither treatment affected suckering. The commonest understorey shrub, *Lasiacanthus* sp., was readily killed by 2% 2,4,5-T in dieselene.

1909. WARDLE, A. P. Notes on arboricide trials at Makueni. [Paper] *E. African Herbicides Conference* 1957. pp. 2. From *abstr.* in *Weed Abstr.* 6 (6), 1957 (816). O.R.E.

Immediately after slashing, stumps of *Acacia pennata* and the surrounding area were completely soaked with 2,4,5-T with or without 2,4-D. Either treatment at 1% in water gave 80% kill within 9 months. 2,4,5-T at 0.5% in oil, applied as a basal spray before the long rains, gave 90% control, higher rates being less effective. Spraying young regeneration of *A. pennata*, *Solanum incanum* and *Gymnosporia* sp. with 2,4,5-T 2% in diesel oil, after the long rains, gave complete kill; lower rates and the mixture were less effective. Foliage sprays of 2% 2,4,5-T in diesel oil after the long rains gave complete kills of *A. pennata* and *Gymnosporia*, lower concentrations being less effective; 0.5% 2,4,5-T in water gave a delayed but complete kill if applied at higher volume rates.

1910. HARKER, K. W. The economics of weed control on grazing lands. [Paper] *E. African Herbicides Conference* 1957. pp. 2. From *abstr.* in *Weed Abstr.* 6 (6), 1957 (808). O.R.E.

*Acacia lockii* subsp. *multijuga* was most economically controlled by combined burning, cutting and arboricides (0.5% 2,4,5-T plus 1% 2,4-D in diesel oil). 100% kill of *A. hebecladoides* may be obtained with basal or stump application of the same mixture.

1911. HOLMES, G. D. Experiments on the chemical control of *Rhododendron ponticum*. *For. Rec. For. Comm. Lond.* No. 34, 1957. pp. 7. Price 9d.

An account is given of the results of experiments carried out by the Forestry Commission 1949-55 [cf. *F.A.* 15 No. 1480; 19 No. 565].  $\text{NH}_4$  sulphamate applied to cut stumps or young regrowth was the only compound giving complete control; 2,4,5-T ester in oil, applied at these stages, considerably reduced vigour of regeneration and proved effective for the control of seedlings. Basal-bark spraying and over-all foliage treatment of standing bushes proved unsatisfactory. From author's summary.

1912. FERENS, P. S. Recent work in management and control of Gorse [*Ulex europaeus*]. *Proc. 9th*

N.Z. *Weed Control Conf.* 1956 (49-53). From *abstr. in Weed Abstr.* 6 (6), 1957 (804). O.R.E.

An account of the transformation of gorse-infested and other scrublands to pasture. Spraying techniques for the use of 2,4,5-T on Gorse are described and discussed.

1913. McLAUGHLIN, J. J. A. **Research notes on weed control.** *Proc. 9th N.Z. Weed Control Conf.* 1956 (83-8). From *abstr. in Weed Abstr.* 6 (6), 1957 (805). O.R.E.

(1) Some factors influencing the effect of 2,4,5-T on Gorse (*Ulex europaeus*). Dilution, time of application and age and growth form were considered. 2,4,5-T (butyl ester) at 3.6 lb. acid equivalent/gal. was applied at dilutions of 1 part in 80, 160, 240, 320, and 400 parts of water and treatments repeated on bushes of different ages at monthly intervals throughout the year. Results indicated that dilutions of 1/80 and 1/160 were best over the whole series, but tended to vary with the time of application. High dilutions were unsatisfactory. Condition of the bushes in relation to flowering was of no importance. The most important factor appeared to be age; young undamaged bushes 3-4 ft. high were most easily killed.

(2) Control of Hawthorn (*Crataegus monogyna*). The following treatments were carried out in winter 1955: (a) undiluted 2,4,5-T painted on cut stumps; (b) a 50/50 mixture of 2,4,5-T and dieselene painted on cut stumps; (c) basal spraying with 2,4,5-T and 1/20 dieselene; (d) monuron at 80 lb./acre sprayed on and around cut stumps; (e) monuron at 80 lb./acre sprayed at ground level round standing bushes. A second series was treated in the following summer with a 2,4,5-T/dieselene mixture, using basal, cut-stump and cover sprays. Results so far available indicate that basal spraying is the best and most economic treatment.

1914. JOHNS, D. L. **Hawthorn control.** *Proc. 9th N.Z. Weed Control Conf.* 1956 (22-4). From *abstr. in Weed Abstr.* 6 (6), 1957 (803). O.R.E.

Reports experimental work with the following as coverage sprays: (1) 2,4,5-T (oil-soluble butyl ester), (2) 2,4,5-T (same formulation) plus amino-triazole, (3) 2,4,5-T (mixed polypropylene glycol butyl ether esters) (4) 2,4,5-TP (same formulation) plus amino-triazole and (5) amino-triazole alone. (1) (2) and (3) were applied in autumn in water at a dilution of 1/80, and all of them in early summer at dilutions of 1/100 and 1/500 in water. Fenuron and monuron at rates from 0.25 oz./bush were applied in water as basal application in the autumn and early summer, and NaClO<sub>3</sub> at 2-8 oz./bush in the same manner in autumn only. 2,4,5-T (oil-soluble butyl ester) in dieselene at a dilution of 1/20 was applied as a basal spray and on frilled stems in the autumn. In early August (late winter) the same mixture was applied as a basal spray, as a spray on cut stumps and on frilled stems. Results to date were somewhat inconclusive, but the 2,4,5-T in dieselene treatments appeared the most promising, as basal sprays or on cut stumps in the dormant period.

1915. DINGWALL, A. R. **Sweet Briar control.** *Proc. 9th N.Z. Weed Control Conf.* 1956 (13-8).

From *abstr. in Weed Abstr.* 6 (6), 1957 (801). O.R.E.

Describes the distribution of Sweet Briar (*Rosa eglantheria*) throughout New Zealand, and summarizes the results obtained from a series of chemical control experiments between 1951 and 1956. (a) Coverage sprays on well established plants: 2,4,5-T (polyethylene glycol, butyl and butoxyl ethanol esters), 2,4,5-T plus 2,4-D, 2,4,5-T plus NaClO<sub>3</sub>, 2,4,5-T plus dinoseb, 2,4,5-TP, 4-CPA, NaClO<sub>3</sub> and a boron-chlorate mixture were applied at different times of year. Three sprayings of the oil-soluble esters of 2,4,5-T proved the most effective, applied at the full-leaf, flowering stage at 1/100 to 1/250. Limited trials showed 2,4,5-TP and a 50/50 mixture of 2,4,5-T (butyl ester) and amino triazole, both at 1/100, to be equally good with or better than 2,4,5-T alone, without proving lethal at one application. (b) Basal applications to established plants: oil-soluble esters of 2,4,5-T in dieselene at 1/40 and 1 pint/plant proved the most reliable and cheap treatment. One application gave satisfactory results. 2,4,5-T in water was not so effective. Also tried, either as sprays to crown and cane bases up to a height of 15 in. or as basal dressings in dry powder form, were NaClO<sub>3</sub>, TCA, boron-chlorate mixture and monuron and fenuron. The two latter proved reliable at 1 oz./plant but were more expensive than 2,4,5-T. (c) Cut-stump regrowth: this was eliminated, generally after one treatment, with either 10% NaClO<sub>3</sub>, 2,4,5-T in water (1/100), monuron or fenuron at 1 oz./stump or less, or boron-chlorate mixture (5%) followed by browsing. 2,4,5-T in dieselene (1/40) at 1 pint/stump killed cut or uncut stumps.

#### 442. Parasitic Higher Plants. Climbers and Epiphytes

1916. KIMMEY, J. W. **Dwarf mistletoes of California and their control.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 19, 1957. pp. 12. 7 refs.

Summarizes biological data on *Arceuthobium* spp., harmful parasites in Californian mixed coniferous stands, and makes recommendations for silvicultural control.

1917. SHEA, K. R. **Extent of the endophytic system of dwarf mistletoe on *Pinus ponderosa*.** *Abstr. in Phytopathology* 47 (9), 1957 (534).

A statistical study, based on the microscopic examination of infections by *Arceuthobium campylopodum* f. *typicum*, covering 2 localities and 2 branches each of 18 combinations (3 branch diameters, 3 branch heights and 2 distances from the bole). The relationships discovered suggest that pruning infected branches where the proximal end of the associated swelling is > 4 in. from the bole, will be effective.

1918. **Dwarf or false mistletoe (*Arceuthobium pusillum* Peck).** *Rep. Me. For. Comm.* 1955-56, 1957 (101).

This mistletoe, usually found on slow-growing *Picea mariana* of acid bogs, has become established on *P. glauca* and *P. rubra* in some coastal areas and islands. Spraying with Maleic Hydrazide 40 and MCPA was unsatisfactory, and the only effective



control measure to date is cutting out heavily infested trees and pruning affected branches and twigs.

1919. **Mistletoe control.** *Rep. For. Timb. Bur. Aust.* 1956, 1957 (26-7).

A large-scale test has been made in the control of mistletoe [*Loranthus* spp.] by making axe cuts in the tree and applying doses of 2,4-D. The dose was determined by means of a modified Biltmore stick, which gave the number of cuts required per tree and the number of shots of poison per cut. A total of 700 trees was treated on an area of 50 acres at a cost of < 6d./tree. Trees averaged 18 in. in diameter. [Cf. *F.A.* 18 No. 2992.]

1920. SCHOLL, R. Weitere Untersuchungen über Veränderungen der Reaktionslage des Birnbaumes (*Pirus communis* L.) gegenüber der Mistel (*Viscum album* L.). [Further research on variations in the reaction of Pear trees to mistletoe.] *Repr. from Phytopath. Z.* 28 (3), 1957 (237-58). 27 refs. [G.g.]

Resistance of 3 Pear varieties varied with the variety, the age of the twig attacked, season of infection, strain of mistletoe and presence of earlier infections. [Cf. *F.A.* 14 No. 1306.]

#### 443. Fungi and Bacteria

See also Nos. 1404-5, 1614.

1921. DOWSON, W. J. **Plant diseases due to bacteria.** University Press, Cambridge. 2nd ed. 1957. pp. xv + 232 + 30 photos. Many refs. Price £1. 12s. 6d.

The manual has been revised throughout, and a chapter added on the preservation of bacterial cultures. [Cf. *F.A.* 12 No. 2335.]

1922. FABRICATORE, J. A. Le malattie delle piante ornamentali osservate in Italia. Dicotyledoneae. Parte quarta. [Diseases of ornamental plants in Italy. Dicotyledons. Part IV.] *Ann. Sper. agr. (n.s.)* 11 (5), 1957 (i-xlvii). 14 refs. [It.] [Cf. *F.A.* 19 Nos. 571-2]. C.G.B.

1923. STEFANIK, L. A kutikuláris exkrecio szerepe a fenyőcziracsemeték mikózisos pusztulásában. [The role of [cotyledonous] cuticular excretion in the damping-off of coniferous seedlings.] *Erdész. Kutatás., Budapest* 1956 (4), (149-65). 21 refs. [Hu.hu.russ.e.g.]

A detailed study of *Fusarium oxysporum* var. *aurantiaca* in the cotyledons of Scots and Austrian Pine, Spruce and Silver Fir, covering the temperature range for conidial development (15-37.5° C., optimum 25°) and the effect of the cuticular excretion on elongation of asci. The study showed that none of the seedlings had primary immunity (resistance to entrance) or secondary (inhibition after stomatal penetration). Only in the Spruce was there a relatively strong secondary resistance due to the inhibitory effect of the cuticular excretion on the fungal exo-enzymes (pectinase and cellulase) on which the pathogen depends for its virulence.

1924. MARTIN, J. T., BATT, R. F., and BURCHILL, R. T. **Defence mechanism of plants against fungi:**

**fungistatic properties of Apple leaf wax.** *Nature, Lond.* 180 (4590), 1957 (796-7). 9 refs.

Leaf waxes from several varieties of Apple were extracted and analysed, and data on the resulting fractions are tabulated. The waxes and their constituents were examined for their ability to inhibit the germination of the conidia of mildew (*Podosphaera leucotricha*) and the results (tabulated) showed that most of the constituents showed some, and the ether-soluble acids considerable (3% germination compared with 55% for controls), inhibiting power. The toxicity of the ether-soluble acids was also shown in tests with *Botrytis fabae*, deposits of the acid on broad-bean leaves entirely suppressing the formation of fungus lesions.

1925. MARTIN, J. T., and SOMERS, E. **Solubilization of copper by leaves and water-soluble acids from leaf wax.** *Nature, Lond.* 180 (4590), 1957 (797-8). 6 refs.

As part of an investigation into possible mechanisms of the fungicidal action of Bordeaux mixture on plant surfaces, the authors determined the solubilization of Cu from dry deposits of Bordeaux mixture on different leaves (a). Other tests were made using the water-soluble acids separated from leaf waxes (b) [see preceding abstract]. The results (tabulated) showed that both (a) and (b) are capable of solubilizing Cu from spray deposits, and it is concluded that the host plant in this way plays the primary part in bringing about the fungitoxic action of Bordeaux or Burgundy mixture.

#### 443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 1923.

1926. VAARTAJA, O. **Effect of *Trichoderma* on tree seedlings and on their pathogens.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (5), 1957 (1).

Experiments made by the author with several strains of *Trichoderma*, several forest soils, *Pinus banksiana* and other tree seedlings, and several damping-off fungi, indicate that: (1) *Trichoderma* strains are potentially pathogenic, especially under weak light, and strains differ in pathogenicity; (2) *Trichoderma* is antagonistic to *Rhizoctonia solani* when grown on agar plates, reducing its growth at a distance of several cm. and overgrowing it when the two cultures meet; (3) neither the potential pathogenicity nor the potential antagonism to other pathogens, of *Trichoderma* is realized in certain soils. A suggested explanation of (3) is that the antibiotics produced by *Trichoderma* may accumulate under certain conditions but not under others, e.g. they may be largely inactivated by fine particles of soil.

1927. COCKERILL, J. **Experiments in the control of damping-off at the nursery, Orono, Ontario.** *For. Chron.* 33 (3), 1957 (201-4). 1 ref.

Soil acidification treatments using FeSO<sub>4</sub> and sawdust mulch were not effective in controlling damping-off losses in forest nursery seedbeds. Soil fumigation with MeBr resulted in reduced pre-emergence losses and consequent higher emergence of seedlings; but it failed to provide adequate

protection during a period of severe damping-off, when total mortality was much the same in treated and untreated beds. *From author's summary.*

1928. IMAI, S., TAKEI, T., and ISHIKAWA, T. Studies on the control of damping-off of coniferous seeds [*Abies mayriana*] in Hokkaido. *Repr. from Jubilee publication in commemoration of the sixtieth birthdays of Prof. Tochinai and Prof. Fukushima*, Tokyo. 1955 (145-52). 25 refs. [E.e.jap.] I.M.I.

In experiments with *Abies mayriana* at Kagura nursery to control *Rhizoctonia solani*, *Botrytis* and *Fusarium* species, using varying dosages of (a)  $H_2SO_4$ , (b) Mercron, (c) Mercron-dust, (d) Neomercron-dust and (e) Uspulun, treatments with (a) diluted 150 times (by volume) with water, at 40 c.c./sq. m., immediately after autumn sowing, and with (c) or (d) (3% of seed weight dusted over the seed before autumn sowing) gave best results. Treatment of emerging seedlings (from treated or untreated seed) in spring with (a) and (e) increased losses, unless sufficient supply of water was available. Stored seeds suffered more from pre-emergence damping off than freshly harvested seed.

1929. WRIGHT, E. Influence of temperature on damping-off of American and Siberian Elm [*Ulmus americana* and *U. pumila*], Black Locust, and Desertwillow [*Chilopsis linearis*]. *Phytopathology* 47 (11), 1957 (658-62). 9 refs.

Pre- and post-emergence mortality from damping off in the greenhouse was more severe in soil at 95% moisture capacity than at 50%, but final stands of seedlings were not significantly different. Isolations showed that Robinia was highly susceptible to *Pythium ultimum*, and *C. linearis* to *Rhizoctonia solani*, at both moisture levels. Low temperatures (15° C.) increased pre-emergence losses in *U. americana* and *C. linearis*. *Rhizoctonia* appeared more pathogenic than *Pythium* at the highest temperature, 29° C., which stunted growth in *U. americana* and *C. linearis* seedlings. No consistent relation appeared between growth rate of the pathogens *in vitro* and apparent virulence to seedlings at the same temperatures.

1930. LEROY, M. Enseignements à tirer d'une attaque de rouge cryptogamique dans les régénérations de pin sylvestre de la Forêt de Haguenau. [Lessons to be learnt from an attack of *Lophodermium pinastri* on *Pinus sylvestris* regeneration in Haguenau forest.] *Rev. for. franç.* 9 (10), 1957 (745-9). [F.]

Observation showed that the disease was more severe on dense groups of natural regeneration than in plantations, and on broadcast sowings than on strip sowings. Where sowing had been done on screefed strips with the removed material piled along the edges, seedlings that had overtopped this 'wall' were uninfected, while all those below that level were severely attacked. Where weeds and grass had been allowed to grow up between sown strips, the same difference was observed between seedlings above and below the level of the weeds. Plantations on clean cultivated ground with regular weeding between rows were completely immune.

1931. PESANTE, A. Seccume di pioppi in vivaio. [Dieback of Poplars in the nursery.] *Notiz. Malatt. Piante (n.s.)* No. 18, 1957 (65-6). [It.] I.M.I.

Describes a dieback of Poplar occurring in nurseries near Turin at the end of Sept. No fungus infection was found, and inoculation with gram-negative bacteria isolated from affected plants failed to produce symptoms. It was noted that some plants that had been cut right back after hail damage in June, were unaffected.

#### 443.3. Diseases of Older Stages

See also No. 1457.

1932. BAGCHEE, K. Diseases of forest trees in India—causes, effects and methods of prevention. [Forest Research Institute, Dehra Dun.] 1957. pp. 18. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses in some detail diseases of *Shorea robusta* [cf. *F.A.* 19 No. 1950] and, more briefly, those of other important Indian trees.

1933. A forest disease survey of Alaska. *Suppl. to Plant Dis. Repr.* No. 247, 1957 (87-98). A.P.B.

Notes on general conditions of disease, with a list of fungi collected on various host trees during the survey.

1934. BUTIN, H. Die blatt- und rindenbewohnenden Pilze der Pappel unter besonderer Berücksichtigung der Krankheitserreger. [The leaf- and bark-inhabiting fungi of Poplars, with special reference to pathogenic species.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 91, 1957. pp. 64. Many refs. [G.]

Lists 94 leaf- and 51 bark-inhabiting species, with their synonyms, morphology, injuries, and hosts (including differential susceptibility). A preliminary chapter presents tabulated data on the frequency and distribution over the stem, of 20 species found on 5-year-old trees of *Populus × robusta* which had been killed by *Dothichiza populea* but were still standing.

1935. TRUSZKOWSKA, W. Obserwacje niektórych grzybów pasożytniczych i saprofitycznych na pędach *Populus euramericana marilandica* Bosc. w Turwi (woj. poznańskie). [Some parasitic and saprophytic fungi on young *P. × marilandica* at Turew near Poznań.] *Acta Soc. Bot. Polon.* 26 (2), 1957 (257-69). 13 refs. [Pol.pol.f.] O.B.D.

Presents the results of observations made during the years 1953, 1954 and up to February 1955. The following species were found: *Lophiotrema nucula*, *Lophidium populi*, *Cryptosporella populina*, *Valsa sordida*, *V. nivea*, *Cryptosphaeria populina*, *Phoma crepini*, *Cytospora chrysosperma*, *C. nivea*, *Dothichiza populea*, *Coryneum populi* and *Tubercularia vulgaris*. The best developed trees were those planted along an avenue; the poorest, those in a plantation on a peat bog. *From author's summary.*

1936. ETHERIDGE, D. E., and CARMICHAEL, E. Observations on *Coryne sarcoides* (Jacq.) Tul. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (3).

In earlier reports [cf. *F.A.* 17 No. 2954] the occurrence and distribution of *Coryne sarcoides* in



the heartwood of decayed and healthy trees in Alberta were considered in some detail. Laboratory and field observations have now provided further data. Incidence was found to be higher on *Picea abies* (35% of 138 decay samples) than on *Pinus contorta* (7.5% of 335 decay samples); incidence in samples of *Picea mariana*, *Pseudotsuga taxifolia* and *Abies balsamea* was about the same as for *Picea glauca*. No trace of the fungus was found in 8 decay samples of Balsam Poplar and 75 of Trembling Aspen. Previous data all concern occurrence in living trees. A study has now been made of slash, and it was found that the % of occurrence of *C. sarcoides* in Lodgepole Pine slash 2 years after felling was 7.2, rising to 10.3 in the 3rd and 13.8 in the 4th year. Laboratory studies showed that wood infected with this fungus had little or no loss in weight after incubation for 3–5 months. Microscopic examination revealed the fungus at depths of several mm. and hyphae were observed penetrating the cell walls by minute bore-holes, and being much constricted at each bore-hole. This behaviour is characteristic of non-decay-producing fungi and has been associated with the inability of these fungi to penetrate the cell wall by enzymic action. There is some evidence, however, that certain constituents of wood are decomposed by the enzymic action of *C. sarcoides*, but that the action is too slow or of a kind that cannot be measured by weight loss. Certain strains of *C. sarcoides* have been found to produce an antibiotic antagonistic to several species of wood-destroying fungi. Several isolates were very active in preventing the growth of *Coniophora puteana* on agar plates, and the antagonism of one isolate was shown to the extent that decay by *C. puteana* and *Polyporus tomentosus* was reduced by 50–75% of that obtained in controls. Further investigations are being made to determine the incidence of these strains antagonistic to wood-destroying fungi.

#### Stem, Butt and Root Rots; Root Diseases

See also Nos. 1726, 1736, 1936.

1937. PARRISH, W. B., MYSER, W. C., and POOL, M. P. Radio-isotopes—a possible means for finding defects in logs and trees. *J. For.* 55 (11), 1957 (851–2).

A preliminary report discussing the possibility of detecting internal decay or defects in a log by subjecting it to  $\gamma$ -rays and counting the number of rays that pass through by means of a 'scintillation spectrometer'. No definite results are reported.

1938. SCURTI, J. C. Sulla demolizione della cellulosa e della lignina per opera dei funghi lignicoli. [The destruction of cellulose and lignin by wood-inhabiting fungi.] *Nuovo G. bot. ital. (n.s.)* 63 (2/3), 1956 (411–2). 6 refs. [It.] A.P.B.

(a) *Armillaria mellea*, (b) *Collybia velutipes*, (c) *Schizophyllum commune* and (d) *Fomes* sp. were grown *in vitro* on (1) pure cellulose, (2) pure lignin. It was found that (b), (c) and (d) could make use of both (1) and (2), whereas (a) which, in nature, destroys cellulose but not lignin [cf. *F.A.* 17 No. 4514], *in vitro* made use of lignin but not of cellulose.

1939. KÄÄRIK, A., and RENNERFELT, E. Investigations on the fungal flora of Spruce and Pine

stumps. *Medd. SkogsforsknInst., Stockh.* 47 (7), 1957. pp. 88. 53 refs. [E.e.sw.] Price Kr.5.

The sporophores and cultural characteristics of about 25 fungi isolated from stumps at various times are described in detail. A study of sporophores on stumps showed that: (1) *Armillaria mellea* appears rapidly on Spruce stumps; (2) *Peniophora gigantea*, *Trechispora brinkmanni*, *Polyporus abietinus* and *Stereum sanguinolentum* are the dominant stump fungi, found on 20% of the stumps examined; (3) there is a rather larger number of species on Spruce than on Pine; and (4) *Peniophora gigantea* is very common on Pine. When increment cores were taken from stumps and cultured, the slow-growing mycelium of *A. mellea* was rarely found, whereas *Fomes annosus* occurred in 7.6% of cores from stumps of trees healthy at the time of felling [cf. *F.A.* 18 No. 4228] and in ca. 76 % of those already damaged by rot. The most common fungi in the cores were *Peniophora gigantea*, *T. brinkmanni* and *S. sanguinolentum*, and they were more frequent in the upper parts of the stump. In soil-block experiments in the laboratory, *Peniophora gigantea*, *F. pinicola*, *Polyporus borealis*, *Lenzites sepiaria*, and *F. annosus* caused a large weight loss in Spruce and Pine, *T. brinkmanni* and *S. sanguinolentum* only a slight one. In Pine, sapwood was attacked more than heartwood, but in Spruce there was little difference. A field study showed that the m.c. of the stumps varied considerably with the age of the stump and the degree of rot. Decomposition in Spruce, as determined from changes in density, increased with age in 0- to 5-year stumps, proceeding more rapidly in sapwood than in heartwood. In Pine stumps, however, decomposition was complicated by the formation of large amounts of resin, which might arrest it and also cause an increase in density. Spore germination appears to occur most readily in the inner part of the sapwood. The first appearance of infection and the progressive decomposition of 1- to 5-year stumps are illustrated by photographs.

1940. ROBERTS, K. A list of fungi collected in Wattle plantations. *Rep. Wattle Res. Inst. S. Afr.* 1956/57, 1957 (26–8).

Contains 68 casually collected species, subdivided into 4 abundance classes and grouped by habitats: (1) decaying stumps and deadwood; (2) wet decaying twigs in brush piles; (3) humus and bare soil; (4) living trees and fresh stumps; (5) miscellaneous. The 4th group comprises *Amauroderma rude*, *Schizophyllum commune*, *Corticium salmonicolor*, *Hydnum henningsii* and *Polystictus hirsutus*.

1941. PERSSON, E. Über den Stoffwechsel und eine antibiotisch wirksame Substanz von *Polyporus annosus* Fr. [The metabolism and an antibiotic substance of *Fomes annosus*.] *Phytopath. Z.* 30 (1), 1957 (45–86). 3 pp. of refs. [G.g.] O.R.S.

Studies of cultures *in vitro* showed little difference between strains from Spruce and Pine, except that optimum growth of the latter occurred on a more acid medium. Growth, metabolic products and antibiotic effect of the fungus are discussed in detail.

1942. [*Fomes annosus*.] *Norsk Skogbr.* 3 (23/24), 1957 (623...632). 8 refs. [Nor.or Dan.]

Three papers: A general account of the fungus, damage, infection, effect of soil and climate, resistance of individual trees, economic loss, and control (*F. Roll-Hansen*), Damage in Vestland (*H. Robak*), and in Denmark (*A. Yde-Andersen*).

1943. HOLMSGAARD, E. Forsøg på en opgørelse over *Trametes-skadernes økonomiske betydning*. [Calculations of the economic importance of damage by *Fomes annosus*.] *Dansk Skovforen. Tidsskr.* 42 (4), 1957 (237-43). [Dan.]

The estimated annual loss from felling infected trees for fuelwood, degrade in sawtimber and poorer utilization of undamaged parts of the stem is 5.2 million kr. for the whole of Denmark. Other loss not easily assessed financially, e.g. felling before economic maturity is reached, probably amounts to at least another 3 million kr. annually. [Cf. *F.A.* 17 No. 1738.]

1944. DAVIDSON, A. G. Studies in forest pathology. XVI. Decay of Balsam Fir, *Abies balsamea* (L.) Mill., in the Atlantic provinces. Repr. from *Canad. J. Bot.* 35, 1957 (857-74). 15 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 395.)

Analyses of ca. 2600 living Balsam Fir established that, after adjustment for age, differences in the amount of cull caused by decay existed between some of the localities. The effect of age on trees between 60 and 120 years is expressed mainly in the number of trees infected with decay, but in some areas also in the amount of butt cull in such trees. Differences in the amount of stem cull between localities could be attributed to differences in the number of trees possessing this type of decay. Differences in the amount of butt cull were caused both by the number of trees infected with butt rot and by the amount of cull in such trees. Further studies are needed to determine reasons for differences. From author's summary.

1945. ETHERIDGE, D. E. Relationships between site and decay in subalpine Spruce in Alberta. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (5), 1957 (1-2).

The following factors were found to have a positive influence on incidence of root and butt rots: aspect (W., S.W., S.), altitude (< 4400 ft.), slope (> 14.5%), depth of humus (< 1.75 in.), soil pH (< 5.95). Other influential factors were soil moisture, total soil N, and soil texture.

1946. ETHERIDGE, D. E. Moisture and temperature relations of heartwood fungi in subalpine Spruce. Repr. from *Canad. J. Bot.* 35, 1957 (935-44). 10 refs.

Decay at different moisture levels was tested on  $1 \times 1 \times \frac{3}{4}$  inch blocks of Spruce heartwood (*Picea glauca*), which were sawn in sequence from air-dry samples of wood (sp. gr. ca. 0.34) in series of 9. Tests were made in triplicate with *Coniophora puteana*, *Flammula conissans*, *Stereum sanguinolentum*, *Peniophora septentrionalis*, *Coryne sarcoides* and an unidentified fungus known as the unknown C,

and in duplicate with *Fomes pini* and *Polyporus tomentosus*. The optimum m.c. for maximum development in wood was higher for trunk-rotting fungi, but the optimum and maximum temperature for growth on malt agar was ca. 5° C. lower for the butt-rotting fungi. The fungi appeared to have the power of regulating to some extent the m.c. of the wood to suit their development. There is evidence of a relationship between the maximum growth of the fungi on agar and their maximum development in wood. The possibility that adaptation to different host environmental conditions might explain differences in the moisture and temperature requirements of the fungi is discussed.

1947. BAKSHI, B. K. Occurrence of *Polyporus squamosus* (Huds.) Fr. in India. *Indian Phytopathology, New Delhi* 9 (2), 1956 (191-4). 4 refs. I.C.I.

The fungus has been found on living *Juglans regia* and *Alnus nepalensis* and on dead *Populus* sp. Its sporophores, the types of decay in wood, and cultural characteristics are described.

1948. BAKSHI, B. K., and SINGH, S. Wilt disease of Shisham (*Dalbergia sissoo* Roxb.). III. Studies on soil fungi (excluding *Aspergillus* and *Penicillium*) isolated from Shisham forests. *Indian Phytopathology, New Delhi* 9 (2), 1956 (114-24). 19 refs. I.C.I.

Gives a systematic account of 19 species isolated. The effect *in vitro*, of different soil fungi on *Fusarium solani* and their occurrence in the rhizosphere of healthy and diseased trees, will be reported later.

1949. BAKSHI, B. K., ARORA, K. K., and SINGH, S. Root diseases of Shisham (*Dalbergia sissoo* Roxb.). VI. Incidence of diseases in relation to soil pH and soil texture. *Indian For.* 83 (9), 1957 (555-8 + 2 photos). 2 refs.

[Cf. *F.A.* 19 No. 606.] A significant correlation has been found between soil texture and incidence of root diseases (*Fusarium solani*, *Ganoderma lucidum* and *Polyporus gilvus*). There is little disease on sand or loamy sand soils, more on sandy loams, and a high incidence on clay-loam or clay soils. There was no correlation between disease and soil pH.

1950. BAKSHI, B. K. Heart-rots in relation to management of Sal [*Shorea robusta*]. *Indian For.* 83 (11), 1957 (651-61 + 16 photos).

[Cf. *F.A.* 19 No. 1932.] *Shorea robusta* in India suffers from heart rot due to 3 fungi, *Fomes caryophylli*, *Hymenochaete rubiginosa* and *Fomes fastuosus*, which cause serious loss. Infection occurs in trees between 15 and 35 years, through wounds due to fire, frost, or mechanical injury. The symptoms and progress of decay are described; in many cases external symptoms are absent. Silvicultural measures to control heart rot include protection from fire, manipulation of the canopy to prevent frost and suppression, thinning, and improvement fellings. All diseased trees should be removed to prevent further loss in net volume recovery and spread of decay to the residual crop. Injury to the standing crop from falling trees should be minimized by



lopping side branches before felling. Infected stumps should not be coppiced. The felling age should be lowered in forests with a high incidence of heart rot. *From author's summary.*

1951. CRISTINZIO, M., and VERNEAU, R. L'etiologia del 'mal ner' del noce in Campania. [The etiology of a disease of *Juglans regia* [caused by *Phytophthora cambivora*] in Campania.] *Ricerche, osservazioni e divulgazioni fitopatologiche, per la Campania ed il Mezzogiorno, Istituto di Patologia Vegetale, Napoli* No. 12, 1954 (3-34). 36 refs. [It. it. e.] I.M.I.

The disease in Walnuts, serious and widespread in the south of Italy, differs in many respects from the 'ink disease' of Chestnuts caused by the same pathogen.

#### Wilts, Diebacks etc.

See also No. 1948.

1952. PURNELL, H. M. Shoot blight of *Pinus radiata* Don caused by *Diplodia pinea* (Desm.) Kickx. *Bull. For. Comm. Vict.* No. 5, 1957. pp. 11. 4 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Laboratory experiments demonstrated that warmth and humidity are necessary for active growth of *D. pinea* and that it was necessary to damage a needle slightly before infection would occur. It is probable that, in the field, warm humid weather and injury by leaf-sucking insects are necessary prerequisites of infection.

1953. Dutch Elm Disease. *Publ. Dep. Agric. Can.* No. 1010, 1957. pp. 11.

A general account, with some indication of the spread of the disease in Quebec and Ontario.

1954. FERGUS, C. L., and STAMBAUGH, W. J. An irregular and unusual formation of mycelial mats by *Ceratocystis fagacearum*. *Mycologia* 49 (5), 1957 (761-6). 13 refs. P.R.

#### Cankers, Stem Rusts etc.

See also Nos. 1523, 1617, 1857, 1934-5, 2099, 2101.

1955. MARTIN, E. I. Neoplastisches Wachstum bei *Sequoiadendron giganteum* Buchholz. [Neoplastic growth in *Sequoia gigantea*.] *Phytopath. Z.* 30 (3), 1957 (342-3). 1 ref. [G.] O.R.S.

The presence of burls on young plants, and their position in mature trees at the root collar or low in the stem, suggests that infection by *Agrobacterium tumefaciens* begins primarily in the juvenile stage. The structure of burls is discussed and illustrated by photomicrographs.

1956. WRIGHT, E. *Cytospora* canker of Rocky Mountain Douglas Fir. *Plant Dis. Repr.* 41 (9), 1957 (811-3). A.P.B.

*C. kunzei* was isolated from Douglas Fir suffering from pitch-girdle canker. Inoculation tests show that the pathogen develops best under thin bark. Deficiency in moisture seems to be a predisposing factor.

1957. TOOLE, E. R. Twig canker of Sweetgum. *Plant Dis. Repr.* 41 (9), 1957 (808-9). 2 refs. A.P.B.

*Botryosphaeria ribis* was isolated from cankered and dying twigs of *Liquidambar styraciflua* and inoculation experiments proved its pathogenicity. It appears however to be harmful only to shaded or weakened twigs and branches.

1958. GYÖRFI, J. Az erdei fák rákos megbetegedései. [Canker diseases of forest trees [in Hungary].] *Erdész. Kutatás., Budapest* 1957 (1/2), (83-94). 11 refs. [Hu. russ. e.g.]

Notes on frost canker, Poplar canker (*Pseudomonas syringae* f. sp. *populea*), *Nectria galligena* and *N. ditissima*, *Dasycephala wilkommii*, and *Melampsorella caryophyllacearum*. Against this last (the Silver Fir canker) the maintenance of close stands reduces the numbers of the light-demanding alternate hosts (4 genera of Caryophyllaceae).

1959. UMAEVSKAJA, M. A. Bakterial'nyj Črak topolja. [Bacterial canker of Poplar.] *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 1957 (3), (40-4). 7 refs. [Russ.] A.P.B.

Bacteria identified as *Pseudomonas rimefaciens* were isolated from cankers on [unspecified] Poplars in Russia [region not stated]. These were used in pure culture or as suspensions in various liquids for test inoculations of *Populus balsamifera* plants; cankers developed on inoculated plants only if the bark was wounded, and then only in spring. The symptoms of the disease and the cultural characters of the bacteria are outlined.

1960. WRIGHT, E. *Cytospora* cankers of Cottonwood. *Plant Dis. Repr.* 41 (10), 1957 (892-3). A.P.B.

A comparison of two 5-year-old shelterbelts near Orchard, Nebraska, shows the relationship between vigour and occurrence of *Cytospora chrysosperma* disease. In *Populus deltoides* growing on deep sandy soil with an abundance of subsoil moisture and good root development, no *Cytospora* cankers or fruit bodies were found. On shallow loamy soil with a clay hardpan ca. 6 ft. below the surface, cankers were numerous. Drought appeared to be the main factor causing the decline of the plantation and consequent susceptibility to *C. chrysosperma*.

1961. VELDEMAN, R., and WELVAERT, W. Studië van *Dothichiza*. [Studies of [the spore germination of] *D. populea*.] *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 21, 1956 (555-69). [Du. du. f. e.] C.G.B.

Analysis of the fungal flora from infected parts of young 'Robusta' Poplars showed, in addition to *D. populea*, considerable populations of *Cytospora*, *Phoma*, *Alternaria* and *Cladosporium* species and others. Culture filtrates from some of these fungi had a marked inhibitory effect on spore germination of *D. populea* (90% for *Alternaria*). Ultra-violet rays, and exposure of the fruiting bodies to temperatures > 30° C. or < 0° also had marked inhibitory effects, frost killing ca. 50% of the spores, and exposure to 45° 100%. Germination was almost 100% between 10° and 30° and even at 5° and 35° it

was still ca. 77 and 40% respectively. Desiccation reduced germination, but even after 5 days' drying it was still 10%. Germination % was high in nutrient media having pH values between 3.2 and 7.4, but nil at pH 8.5. It is suggested that this susceptibility to alkalinity might be used in protection, e.g. by lime washing young trees.

1962. SCHÖNHAR, S. Zur Frage der Bekämpfung von *Dothichiza populea*. [Control of *D. populea*.] *Forst- u. Holzw.* 12 (24), 1957 (421-2). 9 refs. [G.]

Infection, though possible at all seasons, was most frequent in summer, and repeated sprayings from May to September considerably reduced its incidence. Cupravit ( $\text{Cu}_2\text{OCl}_2$ ) in 0.5% solution was slightly less effective than captan (Orthocide 50) in 0.3% solution. Infection trials resulted in 90% infection through bark cuts and nearly 40% on unwounded 1 + 1 stock either at the base of the new shoot or at the branching point of laterals.

1963. BIER, J. E. The relation of bark moisture to the development of canker disease with particular reference to *Cryptodiaporthe* canker on Willow. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (3-4).

Laboratory studies on the development of natural and artificially induced *C. salicina* cankers proved that canker growth is rapid in bark with a m.c. of 50-55% of the weight of green bark. The m.c. of bark of dormant Willows falls within this range. An increase in bark moisture to ca. 60% resulted in a cessation of canker growth. Such an increase occurs with the breaking of dormancy. The use of m.c. of bark as an index to vulnerability, is suggested.

1964. DILLER, J. D. Testing American Chestnuts for blight resistance. *For. Res. Note Ntheast. For. Exp. Sta.* No. 74, 1957. pp. 3.

Includes a sketchmap showing the location of living *Castanea dentata* trees reported from different parts of the U.S.A.

1965. BAZZIGHER, G. Über Anfälligkeit und Resistenz verschiedener Wirte von *Endothia parasitica*. [Susceptibility and resistance of some hosts of *E. parasitica*.] *Phytopath. Z.* 30 (1), 1957 (17-30). 21 refs. [G.g.e.] O.R.S.

The main histological reactions to attack are formation of callus, tyloses and a cork barrier. In Beech, cork-barrier formation prevented further attack but in Chestnut the pathogen attacked the cambium again in all examples studied. Cultures showed that *E. parasitica* is not heterotrophic for aneurin or biotin but is so for some other growth substance, at present unidentified, that occurs in yeast extract. A variation in the amount of growth substances present in the host might be decisive for presence or absence of the disease. In tests over 2-5 years 90-95% of *Castanea sativa* and only 0-1% of *C. mollissima* were successfully infected. Treatment with certain inhibitors of respiratory enzymes (e.g. acroflavin, pyrogallol) increased infection in *C. mollissima* to 60-80%. Frost also appeared to lower resistance in *C. mollissima*.

1966. DARPOUX, H., RIDÉ, M., and BONDOUX, P. Apparition de foyers d'*Endothia parasitica* sur

châtaigniers en France. [The appearance of foci of *E. parasitica* among Chestnuts in France.] *C.R. Acad. Agric. France* 43 (12), 1957 (670-4). [F.] A.P.B.

The fungus has been found on trees in the departments of Ardèche and Basse Pyrénées. Possible sources of infection, e.g. from migrating birds or from tools used by Italian fellers working in Ardèche are discussed. The compulsory declaration and destruction of diseased trees, and breeding of resistant varieties are recommended.

1967. KURTH, A., et al. Il cancro corticale del castagno nel Cantone Ticino. [Chestnut blight in Canton Ticino.] *Mitt. schweiz. Anst. forstl. Versuchsw.* 33 (2), 1957 (33-69 + 2 plates). 66 refs. [It.it.g.f.e.]

Chiefly a review of the problem of *Endothia parasitica*, alternative hosts, chances of chemical or biological control, and selective breeding, with some preliminary results of current work at the Swiss Forest Research Institute on vegetative propagation, resistance testing etc. The practical solution advocated is generally conversion to more valuable timber species.

1968. HAYES, G. L., and STEIN, W. I. Eliminating blister rust cankers from Sugar Pine by pruning. *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 151, 1957. pp. 8.

On the S. Umpqua Experimental Forest, Ore., in 1952, > 4000 *Pinus lambertiana* were pruned of their lower branches to a height of 18 ft. (provided that  $\geq \frac{1}{3}$  of the live crown length was removed). Details are given of time and costs, and of canker incidence.

1969. MIELKE, J. L. The Comandra blister rust in Lodgepole Pine. *Res. Note Interm. For. Range Exp. Sta.* No. 46, 1957. pp. 8. 25 refs.

Notes on the range, hosts, life history and ecology of *Cronartium comandrae*. The nature and extent of the damage are discussed briefly, and control measures described.

1970. KLAUITTER, R. A. Most cankered trees are good risks in Loblolly Pine sawtimber stands. *Res. Note Stheast. For. Exp. Sta.* No. 107, 1957. pp. 2. 1 ref.

Twenty-one dominant and co-dominant trees with 10-50% of their circumferences cankered by fusiform rust, were left in a 40-year even-aged stand at Santee Experimental Forest. Their height and diameter growth over 10 years were equal to those of sound trees on an adjoining plot, and they withstood gales of up to 60 m.p.h. [Cf. *F.A.* 12 No. 717.]

1971. BOYCE, J. S. The fungus causing Western gall rust and Woodgate rust of Pines. *For. Sci.* 3 (3), 1957 (225-34). 16 refs.

Inoculations show that Woodgate rust of *Pinus sylvestris*, frequent in the N.E. United States and eastern Canada, is caused by *Peridermium harknessii*, a species common on 2- and 3-needled Pines in western N. America, where it causes western gall rust. In addition, further proof is given that *P. harknessii* occurs on *Pinus ponderosa*, *P. contorta*, *P. sabiniana* and other Pines of higher elevations in the



mountains, whereas *P. radiata* and other Pines at lower elevations along the Californian coast are attacked by *Peridermium cerebroides*(?) which causes similar galls. *From author's summary.*

1972. STEWART, D. M. **Factors affecting local control of White Pine blister rust in Minnesota.** *J. For.* 55 (11), 1957 (832-7). 1 ref. [See *F.A.* 15 No. 2644.]

1973. MÜLDER, D. Die Bedeutung des Blasenrostes für die Saatgutbeschaffung und Pflanzenanzucht bei Strobe. [The importance of blister rust in seed supply and plant raising of *Pinus strobus*.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (110-3). [G.]

Discusses practical conclusions regarding seed supply, nursery stock, guarantees and indemnification drawn from the author's researches into individual resistance [cf. *F.A.* 17 No. 142]. It is suggested that resistant individuals should be selected from infected 50- to 60-year stands as seed source, and further research be conducted on the susceptibility of juvenile stages.

1974. MIELKE, J. L. **The yellow witches' broom of Subalpine Fir in the Intermountain region.** *Res. Note Intermt. For. Range Exp. Sta.* No. 47, 1957. pp. 5. 12 refs.

Notes on the range of hosts and type of injury from *Melampsorella caryophyllacearum*, parasitic on needles of *Abies lasiocarpa*. Some suggestions are made for control.

### Foliage Diseases

See also Nos. 1930, 1934-5, 2038.

1975. REGLER, W. Der Kieferndrehrost (*Melampsora pinitorqua*), eine wirtschaftlich wichtige Infektionskrankheit der Gattung *Pinus*. [*M. pinitorqua*, a Pine disease of economic importance.] *Wiss. Abh. dtsh. Akad. Landw. Wiss., Berlin* No. 27 (*Beitr. Pappelforsch.* No. 2), 1957 (205-34). 51 refs. [G.g.]

A general description of the life history of the fungus, damage and control, on the basis of the literature, chiefly German and Russian. Overwintering of the uredo stage was observed in buds of *Populus alba* and *P. canescens*, but not of *P. tremula*. Attempts to infect Black and Balsam Poplars were unsuccessful.

1976. ZILLER, W. G. **Studies of Western tree rusts. III. *Milesia laeviscula*, a needle rust of Grand Fir.** *Repr. from Canad. J. Bot.* 1957 (885-94 + 2 plates). 12 refs.

From field observations and inoculation experiments it has been discovered that *M. laeviscula* causes a needle rust on the current year's needles of *Abies grandis*. The rust has been induced, by inoculation, to fruit repeatedly on its alternate hosts, *Polypodium vulgare* and the Fir; its pycnial and aecial stages are described and an account is given of its life history.

1977. CASH, E. K., and WATERMAN, A. M. **A new species of *Plagiostoma* associated with a leaf disease of hybrid Aspens.** *Mycologia* 49 (5), 1957 (756-60). 6 refs. P.R.

Discoloration of leaves in the progenies of intra- and interspecific crosses with *Populus tremuloides* was traced to a new species, *Plagiostoma populi*, which is described.

1978. DONAUBAUER, E. Über eine Blatt- und Zweigkrankheit der Kanadapappel. [A leaf and shoot disease of hybrid Black Poplars.] *Allg. Forstztg.* 68 (23/24), 1957 (341). 6 refs. [G.]

Describes the disease caused by *Venturia populina* and its conidial form, *Pollaccia elegans*, its occurrence in Austria, and possibilities of control. Bordeaux mixture has been tried with varying success.

1979. RACK, K. Untersuchungen über die Anfälligkeit verschiedener Eichenprovenienzen gegenüber dem Eichenmehltau. [The susceptibility of different Oak provenances to Oak mildew.] *Allg. Forst- u. Jagdztg.* 128 (7), 1957 (150-6). [G.g.e.]

A quantitative assessment of infection was carried out, in September 1956, on Oak of 29 German provenances in trial plantations at Bramwald (Hann. Münden) and Syke (Bremen), both established in 1950, by counting the number of diseased leaves among the 10 uppermost leaves of lammas shoots. Variations in infection rate of provenances were great within each plantation, but there was no consistency between the two areas. Analysis of the figures in relation to spatial distribution of plots revealed the influence of local, presumably microclimatic, conditions, which divided each plantation into areas of heavy, medium, and light infection with considerably less variation within each. Further analysis showed the importance of phenology, younger leaves showing a higher infection rate than older ones. This factor contributed to the greater susceptibility of Sessile Oaks, which generally had younger shoots, but there was a slight, though significant difference even between members of similar phenological groups.

### 444. Virus Diseases

1980. CALLAHAN, K. L. ***Prunus* host range and pollen transmission of Elm mosaic virus.** *Abstr. of thesis, in Dissert. Abstr.* 17 (9), 1957 (1861). O.R.S.

Twenty-eight species or varieties of *Prunus* were inoculated by budding with infected Elm buds, and symptoms (most commonly chlorosis and twisting of leaf blades) developed on 15 individuals, representing 13 species. Virus was transmitted by 13 species or varieties when inoculated *Prunus* were budded back to healthy Elm. Symptoms resembled those of some stone-fruit diseases, but the virus differed in host range, and a number of local *Prunus* viruses could not be transmitted to Elm.

Results of tests [cf. *F.A.* 18 No. 3046] on 2432 Elm seedlings obtained by combinations of pollination between healthy and infected parents, using cut branches in the greenhouse, showed that the virus was transmitted by pollen to seed on healthy trees. The virus was not transmitted through the healthy pollinated flower and peduncle nor into the healthy tree. Elm mosaic virus in pollen was found to be active after 3 years storage at 0° C., with a higher concentration of virus in pollen stored over CaCl<sub>2</sub>.

## 45. Damage by Animals

## 451. Mammals

See also Nos. 1684-6, 1754.

1981. SORAUER, P. [Edited by BLUNCK, H.] Handbuch der Pflanzenkrankheiten. Band V. Tierische Schädlinge an Nutzpflanzen. 2 Teil. 5. Lieferung. Vertebrata. [Manual of plant pathology. Vol. V. Animal pests of useful plants. Part 2, No. 5. Vertebrata.] Paul Parey, Berlin. 1958. pp. vi + 402. Many refs. [G.] Price DM.88. [Cf. F.A. 18 No. 4295.]

1982. Wildlife repellents: minutes of the meeting on wildlife repellents at Arnhem (Netherlands) on 3rd and 4th October 1955. Meded. Inst. toegep. biol. Onderz. Nat. No. 32, 1957. pp. 83. [E.F. or G.]

Includes: Damage to crops [including trees] by birds and mammals and methods for the prevention of such damage (E. van Koersveld) [E.] (with a list of 93 species, showing period and nature of damage, discussion of repellents and methods of destruction, extent of damage etc.); Research on hearing in crows (J. Giban) [F.]; Myxomatosis in the United Kingdom (H. V. Thompson) [E.]; [Rabbit] repellents (F. A. Steensma) [G.].

1983. TÜRCKE, F. Neue Erkenntnisse über die Wirkung und Anwendung chemischer Wildschadenverhütungsmittel. [Recent findings on the effect and application of chemical game repellents.] Mitt. biol. Bundesanst. Land- u. Forstw., Berl. No. 83, 1955 (103-4). [G.]

General requirements are a fairly high viscosity at all temperatures, quick drying, hardening, and some content of gritty matter. In discussion, the generally disappointing effect of chemical repellents, as compared with traditional specifics, e.g. liquids in which dogs had been washed, was stressed.

1984. CRANBROOK, EARL OF. Killing of Beech seedlings by voles. Proceedings of the Zoological Society of London 126 (1), 1956 (164). O.R.S.

A newly-planted Beech hedge at Newbiggin on Lune, Westmorland, was considerably damaged by voles, probably the short-tailed vole (*Microtus*), in the winter of 1951-52, 15% of the trees, which were 18-24 in. high and  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., being killed by cutting through at, or slightly below, ground level.

1985. High-level woodlands. Rep. Nat. Conservancy, Lond. 1956/57, 1957 (9-10).

In attempts to establish woodland at high altitudes (1900 ft.) in Westmorland, it was considered probable that broadleaved species (*Sorbus aucuparia*, *Fraxinus excelsior*, *Alnus glutinosa* and *Betula* spp.) would do better if cut back after planting, but experience proved this to be impracticable because of the high vole [*Microtus agrestis*?] population following growth of grass after exclusion of sheep. The young shoots appear to be extremely attractive to voles. Damage to Rowans has also been caused by water voles (*Arvicola amphibius*).

1986. MEHL, S. Zur Differentialdiagnose des Schadbildes, zum Biotop und zur Bekämpfung der Erdmaus (*Microtus agrestis* L.). [Recognition of

the damage caused by *M. agrestis*, its ecology and control.] Mitt. biol. Bundesanst. Land- u. Forstw., Berl. No. 83, 1955 (105-8). [G.]

Contrary to generally negative results with poisoned grain, wheat put round plants after treating with 0.5%  $Zn_3P_2$  flavoured with sugar water and aniseed, and moistened with salad oil, killed out the voles. Re-immigration made a repetition of the treatment necessary.

1987. KRUMP. Ergebnisse der Toxaphen-Bekämpfungsversuche gegen Erdmäuse. [Control of *Microtus agrestis* with toxaphene.] Allg. Forstzeitschr. 11 (15), 1956 (209-10). [G.]

Reports on trials in Bavaria, confirming the effectiveness of the method. A dose of 3 kg. emulsion/ha. sufficed where grass was not too dense, and 4-6 kg. in weed-infested areas. Concentrations were based on 300-400 litres spraying-fluid/ha. with ordinary sprayers, and 50-75 litres with high-pressure types. [Cf. F.A. 18 No. 4268.]

1988. SCHINDLER, U. Aussichtsreiche Versuche zur Bekämpfung der grossen Wühlmaus mit Endrin. [Promising experiments with endrin for the control of *Arvicola terrestris*.] Forst- u. Holzw. 12 (24), 1957 (423-4). 3 refs. [G.]

Describes trials on heavily infested Beech plots on land formerly managed as forest with field crops in the Bramwald district. Endrin with some aldrin, in 20% emulsion at 2 kg./ha. (400 g. active principle) was highly successful. Toxaphene (M 5055 at 8 kg./ha.) was less effective and the emulsifier proved slightly phytotoxic.

1989. NETTLETON, H. I. Wood rats damage young Douglas Fir. J. For. 55 (11), 1957 (845).

On a  $\frac{1}{2}$ -acre plot in a 22-year stand of Douglas Fir in N.W. Oregon, 43% of the trees removed in thinning (d.b.h. between 2 and 11 in.) had been partially or completely girdled by rats (*Neotoma fuscipes*). The damage was largely confined to the upper  $\frac{1}{3}$  of the bole. Poison bait appears to offer the most effective control.

1990. ZOCCHI, R. Scoiattolo, ghio e ratto: tre roditori dannosi. [Squirrel, fat dormouse and rat: three harmful rodents.] Ital. for. mont. 12 (5), 1957 (214-25). 17 refs. [It.it.f.]

Describes the habits of, and damage caused by, the squirrel (*Sciurus vulgaris*), the fat dormouse (*Glis glis*) and the common rat (*Rattus rattus*), to trees in Italy.

1991. SHORTEN, M. Damage caused by squirrels in Forestry Commission areas, 1954-6. Forestry 30 (2), 1957 (151-72).

Examines the replies received from Commission foresters to questionnaires sent out in 1954, 1955 and 1956 on the damage caused to Forestry Commission woodlands in the U.K. by the two squirrels, *Sciurus carolinensis* and *S. vulgaris leucourus*, during the forest years 1954-56. The inquiry was primarily concerned with *S. carolinensis*, for the killing of which rewards have been offered since 1953, but for 1955 and 1956 information was sought also about the red squirrel. The most serious economic



damage done by both squirrels is considered to be the stripping of bark from the stems of growing trees and it is this damage that is examined. The information received is sifted critically and the results summarized in 13 tables and in 2 diagrams. *From author's summary.*

1992. LAWRENCE, W. H. Porcupine [*Erethizon dorsatum*] control: a problem analysis. *For. Res. Note Weyerhaeuser Timber Co.* July 1957. pp. 43. 28 refs.

Describes the animal and its habits and the damage done to Ponderosa Pine, reviews the literature, and discusses factors on which further research is desirable.

1993. COOK, D. B., and HAMILTON, W. J., JR. The forest, the fisher, and the porcupine. *J. For.* 55 (10), 1957 (719–22).

Discusses the ranges of the fisher (*Martes pennanti*) a large, powerful marten and the porcupine (*Erethizon dorsatum dorsatum*) in the N.E. United States, and recommends the introduction of the former into areas where porcupine damage is extensive, as a means of natural control.

1994. [Roe deer attracted to fertilized seedlings.] *Rep. Nat. Conservancy, Lond.* 1956/57, 1957 (10).

An enclosure in the Highlands has had to be netted against roe deer, since it has been found that they seek out and devour young Pines (both transplanted and grown from seed *in situ*) that have been fertilized with ground rock phosphate. Unfertilized Pines are not touched.

1995. Praktischer Einzelschutz gegen Fegen. [Protecting individual trees against rubbing by deer.] *Allg. Forstzeitschr.* 11 (16/17), 1956 (232–4). [G.]

In the Oldenburg district successful protection is reported by tying on to each tree one or more empty tins—food, polish etc.—which are said to act as repellents by sight, sound, and sometimes smell. They should be holed to prevent water from collecting in them.

1996. ZEEDYK, W. D. Why do bears girdle Balsam Fir in Maine? *J. For.* 55 (10), 1957 (731–2).

During the 1956 summer, tree mortality as a result of girdling by black bears was observed for the first time in the Spruce/Fir stands of N. Maine. The bears show a definite preference for Balsam Fir in the large-pole size-class; reasons for this preference are not known.

1997. SCHEBITZ, H. Einbau von 'Wildausläufen' in Kulturzäune. [Constructing 'exits' for game in plantation fences.] *Allg. Forstzeitschr.* 11 (23/24), 1956 (309). [G.]

Suggests building exits for game accidentally caught in an enclosure, consisting of pointed horizontal stakes nearly but not quite touching at an acute angle between poles ca. 3–4 m. apart. In this way the game can squeeze out between the elastic ends, but are prevented by the points from getting in.

1998. FRIEDRICH, R. Kulturzaun nach Muskauer Art. [Muskau-type plantation fences.] *Allg. Forstzeitschr.* 11 (23/24), 1956 (307–8). [G.]

Describes the construction of these fences, developed on the Muskau estate, Silesia. Spruce stakes, 3–5 cm. thick and ca. 1.5 m. long (2 m. against red deer) are stuck in loops formed by twisting two pairs of wires (one pair near the bottom and one near the top) stretched between poles ca. 4 m. apart. Costs are low, as most of the material is locally available and the main work can be done by women.

1999. BRANDSTETTER, H. Einige Ergebnisse aus Gatterbau-Untersuchungen. [Notes on fencing investigations.] *Allg. Forstzeitschr.* 11 (8/9), 1956 (126–8). [G.]

Describes and tabulates materials and labour costs of various types of permanent or mobile fences, based on investigations in Bavaria in 1952–53. Models were chiefly wire netting of different construction, some claimed to be proof against hares, others against roe deer only. For small areas protection of individual trees is generally cheaper.

#### 452. Birds

See also No. 1981.

2000. TURČEK, F. J. Zum Knospenfrass einiger Finkenvögel. [The bud-eating habits of some finches.] *Waldhygiene* 2 (3), 1957 (75–9). 2 refs. [G.e.]

Describes field observations on various finches feeding on buds of Oak, Hawthorn, Blackthorn, Larch, and fruit trees, including the presence of insect pests in or on the buds. Reports on some feeding experiments, chiefly with a hawfinch, which preferred terminal buds to lateral buds in *Quercus sessiliflora* and *Carpinus betulus*, but lateral buds in *Prunus avium*. Consumption of Oak buds was from 73 to 133 a day.

#### 453. Insects

See also Nos. 1329, 1450, 1457–8, 1611, 1614, 2155, 2170.

2001. OSTMARK, H. E. Forest insect conditions in the Central Rocky Mountains 1956. *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 27, 1957. pp. 14. 1 ref.

Surveys show a continued decrease in the numbers of the major insect pests, with the exception of *Dendroctonus pseudotsugae* and *D. monticolae*.

2002. YASINSKI, F. M., and PIERCE, D. A. Forest insect conditions in Arizona and New Mexico 1956. *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 26, 1957. pp. 18. 1 ref.

Aerial and ground surveys in 1956 revealed an increase in tree mortality caused by insects in 1955, estimated at ca. 191 million bd. ft. of commercial timber. There was a marked increase in the extent and severity of damage by the Pine barkbeetle (*Dendroctonus* spp.). Data on the known infestations are tabulated by insect species and intensity of damage.

2003. GÄBLER, H. Über die Organisation, den Stand und die derzeitigen Probleme der Forstentomologie in der DDR. [Organization, present situation

and problems of forest entomology in eastern Germany.] *Anz. Schädlingssk.* 30 (11), 1957 (186-8). 3 refs. [G.]

2004. TEMPLIN, E. Überwachung der Schädlinge im Walde. [Reporting forest pests.] *Dtsch. Landwirtsch.* 8 (10), 1957 (498-500). [G.]

Notes on the forest-pest reporting system used in E. Germany and on identification of pests in the forest.

2005. ZWÖLFER, W. Ein Jahrzehnt forst-entomologischer Forschung. [Ten years of research in forest entomology.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (91-9). 4 refs. [G.]

Summarizes the results of post-war fundamental research in Munich. A connexion was found, for 11 out of 15 secondary pests, between outbreaks and drought injuries to the hosts. In all cases, the state of the host and high populations at the latency stage were more important than predator and parasite levels. The frequent concentration of outbreaks of primary pests on poor sites suggested here, too, the influence of host susceptibility. A connexion was also found between host susceptibility and the density and variety of the soil fauna of the sites. The soil fauna was increased and enriched slowly by liming, and rapidly by  $\text{NH}_3$  gas treatment, and was temporarily reduced by insecticides even when applied to the crowns of the trees.

2006. [Use of systemic insecticides in the study of larval populations.] *Rep. Nat. Conservancy, Lond.* 1956/57, 1957 (14).

A method of estimating [*Tortrix viridana*] caterpillar populations was required, and various sampling techniques have been investigated. The development of the larval population was followed from foliage samples taken from the tree crowns and examined in the laboratory, but some difficulty was experienced in collecting the foliage without dislodging the larger larvae. To avoid this difficulty, a method was used in which the tree trunk was injected with 'Phosdrin', a systemic insecticide, and the poisoned larvae were collected as they dropped off the foliage on to a sheet covering the ground below. The proportion of the population falling off the tree was estimated by enclosing selected twigs, distributed throughout the tree, in muslin bags before treatment and subsequently noting the numbers of larvae retained in the foliage. Preliminary tests suggest that ca. 80% of the larvae on a tree can be collected by this method under suitable conditions. The total mortality of larvae following injections was > 90%. Since the insecticide used has a short residual action and is confined to the Oak trees, its effect on other invertebrates is expected to be slight. Half a c.c. of technical Phosdrin per tree in 5 litres of water was effective in killing the larvae but had produced no phytotoxic symptoms six months after treatment. Some distortion of the foliage was observed on trees tested with higher concentrations on another site outside the Nature Reserve.

2007. OSSOWSKI, L. L. J. Notes on Wattle insects observed during the period 1956-1957. *Rep.*

*Wattle Res. Inst. S. Afr.* 1956/57, 1957 (29-32 + 2 photos).

Acreages infested, stage in epidemics, parasites etc., for 21 species (4 orders, 11 families) including 4 insects not previously recorded. Nearly 100,000 acres were infested with bagworm, *Kotochalia* (formerly *Acanthopsyche*) *junodi*.

2008. MATHUR, R. N. Pests of *Ailanthus excelsa* [in Madhya Pradesh] and their control. Forest Research Institute, Dehra Dun. 1957. pp. 12. 33 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

*Atteva fabriciella* (the most important) and 9 others are described. [Cf. *F.A.* 19 No. 2061.]

2009. BELLIS, E. DE. Parassiti animali dell'eucalitto in Italia. [Insect pests of Eucalypts in Italy.] *Pubbl. Cent. Sper. agric. for.*, Roma 1, 1956 (1957), (185-9 + 4 photos). 5 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

There are no specific pests of Eucalypts in Italy. A note is given on some polyphagous species that sometimes attack them.

2010. TEMPLIN, E. Tierische Blattschädlinge an Pappeln. [Leaf pests on Poplars.] *Forst u. Jagd Spec. No. Die Pappel II*, 1957 (17-36). 24 refs. [G.]

An illustrated account of leaf-mining, leaf-sucking, gall-producing and leaf-eating insects and mites, their systematics, bionomics, economic importance, distribution, host preference etc. and control, including a list of suitable E. German preparations for dusting or spraying.

2011. LYONS, L. A. Insects affecting seed production in Red Pine. II. *Dioryctria disclusa* Heinrich, *D. abietella* (D. and S.) and *D. cambii-cola* (Dyar) (Lepidoptera: Phycitidae). *Repr. from Canad. Ent.* 89 (2), 1957 (70-9). 17 refs. [Cf. *F.A.* 18 No. 1913; 19 No. 655.]

2012. LYONS, L. A. Insects affecting seed production in Red Pine. IV. Recognition and extent of damage to cones. *Repr. from Canad. Ent.* 89 (6), 1957 (264-71). 4 refs.

Presents data collected in Ontario on the time and duration of cone attack by various insect species and the variability in intensity of cone damage from year to year and from one locality to another. Keys are included (1) to insects infesting Red Pine cones, based on damage to the cone, and (2) to the mature larvae of insects commonly inhabiting Red Pine cones. [Cf. *F.A.* 19 No. 655.]

#### Insects: Natural and Biological Control

See also Nos. 2028, 2041, 2043, 2047, 2050, 2052, 2055, 2057, 2067-8, 2070-1, 2082-3, 2085-6, 2088, 2091.

2013. DOWDEN, P. B. Biological control of forest insects in the United States and Canada. *J. For.* 55 (10), 1957 (723-6). 10 refs.

Discusses past and present research on, and results obtained so far in, the biological control of



9 introduced forest pests. Recommendations are made for programmes of biological and ecological research.

2014. ENE, M. Observații asupra ocroririi păsărilor insectivore. [Notes on the encouragement of insectivorous birds.] *Rev. Pădurilor* 1957 (9), (588–90). [Rum.]

Gives figures of occupation of nestboxes in 7 experimental areas for 3 years, with design of nest-box used and some account of the species nesting. A major difficulty is the attraction of the boxes for the common and garden dormice (*Muscardinus avellanarius* and *Eliomys quercinus*).

2015. ZOEBELEIN, G. Zur Frage des biologischen Nutzwerts der roten Waldameise. [The biological usefulness of *Formica rufa*.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (101–6). 2 refs. [G.]

Sounds a note of caution, based on research at Munich showing (a) the difficulties of maintaining healthy colonies in pure Spruce or Pine stands, (b) the inconclusive nature of the evidence of their effect against most pests (except, under certain conditions, *Panolis flammea*), (c) their adverse effect on parasite populations, and (d) possible connexions between heavy lachnid infestations through ant trophobiosis and susceptibility of trees to attack by secondary pests.

2016. PAVAN, M. Bericht über die bisher in Italien durchgeführten Arbeiten zur biologischen Bekämpfung der Schadinsekten im Wald mit Hilfe der roten Waldameise. [Report on measures of biological control of forest pests in Italy, using *Formica rufa*.] *Waldhygiene* 2 (3), 1957 (73–5). 2 refs. [G.]

Reports on the successful transplanting, 6 or 7 years ago, of colonies of *F. rufa rufopratensis* from Alpine regions to the Apennines near Pavia, where they proved highly effective against *Thaumetopoea pinivora*, and to other parts of Italy, including Sicily, the Po plain, and the coast near Genoa.

#### Insects: Chemical Control (General)

See also Nos. 1329, 2005–6, 2010, 2033, 2036–8, 2045, 2049, 2051, 2054, 2057–8, 2075, 2087, 2092.

2017. WATKINS, G., and WALKER, P. T. The use of insecticides in forestry and agriculture. *E. Afr. agric. J.* 23 (2), 1957 (74–81).

Includes 3 tables showing: (1) the constitution, pests controlled by, application and effectiveness of DDT, dieldrin, endrin, aldrin, malathion, chlordane and BHC; (2) 76 trade brands based on these and others, with their formulations and makers; (3) 14 East African forest pests, with hosts, damage and the preventive measures recommended.

2018. SCHRADER, G. Rückschau auf zwei Jahrzehnte Phosphorchemie. [Retrospect on two decades of phosphorus chemistry.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 85, 1956 (3–10). 24 refs. [G.]

Deals with work on the synthesis of phosphoric insecticides at the Bayer works, including E.605

[parathion], Systox and Metasystox, Dipterex, Chlorthion etc., their composition, mode of action, toxicity to mammals etc.

2019. CRAMER, H. H. Über die Auswirkung der Bekämpfung von Forstschädlingen mit Hexachlorcyclohexan-(HCH)-Präparaten auf Waldbiozöten. [The effect on the forest biocoenosis of BHC preparations used for forest pest control.] *Naturwissenschaften* 44 (9), 1957 (290). [G.] O.R.S.

[Cf. F.A. 17 No. 4145.] The effect of BHC 'smokes', sprays and dusts on the insect fauna of Pine stands was examined, during operations to control cockchafer larvae. The numbers of insects killed in the early stages was highest with the smoke and lowest with the spray, but the effect was longest lasting (up to 31 days) with the spray. The high initial effect of the smoke affected flying stages of Terebrantes, Cantharidae, Tineidae, Microlepidoptera and Diptera; the lasting effect of the spray was mainly on phytophagous forms, e.g. Chrysomelidae, Curculionidae, Lyctidae and Tenthredinidae. There was no evidence of secondary poisoning in 93 Carabidae collected from poisoned cockchafers.

2020. ZANON, K. Toxikologische und biologische Wirkung von Malathion. [The toxic and biological effects of malathion.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 85, 1956 (117–21). [G.]

Reports American and German experiments on small mammals, indicating that the toxicity of malathion is much less than that of DDT, chlordane, parathion or Systox; and results of its use against a number of arthropods, including *Coleophora laricella* and *Cacoecia* spp.

#### Orthoptera

2021. SHEPHERD, K. R. Defoliation of Alpine Ash (*Euc. delegatensis*) by phasmids. Forestry Commission of New South Wales, Sydney. 1957. pp. 18. 11 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Plagues of phasmids have caused severe and widespread defoliation in valuable stands of *Eucalyptus delegatensis* in southern New South Wales, resulting in heavy mortality of trees over appreciable areas, and marked reduction in increment over wider areas. The consequent problems of salvage of marketable timber, re-calculation of yield, regeneration and thinning, are discussed.

2022. [Casuarina plantations attacked by locusts.] *Unasylva* 11 (4), 1957 (205).

Large-scale defoliation of Casuarina plantations near the coast in Thailand was found to be caused by a locust, *Aulaches miliaris*, which had not previously been regarded as of any significance, though known to be an occasional pest of trees and shrubs in India and Malaya. Attacks occur only during the rainy season. Young trees usually die, but older ones recover, the time of recovery depending on the amount of rainfall.

## Isoptera

2023. [Termite attack on living trees of *Eucalyptus microcorys*.] *Rep. For. Dep. Nyasaland*. 1956, 1957 (14-5).

Investigation of the death of large and apparently healthy trees confirmed that it was due to termite attack, but that there may be predisposing causes such as loss of topsoil and compaction on old agricultural ground, and lack of water. Experiments are to be made to ascertain whether termite attack can be reduced or avoided by deep cultivation, use of strong pot plants, and treatment of the soil with insecticides.

## Hemiptera

See also Nos. 1330, 1865.

2024. SCHEEFER-IMMEL, V. Über ein Massenauf-treten der Zikade *Idiocerus laminatus* Flor. an *Populus tremula*, mit einigen Bemerkungen zur Biologie und zum Honigtau der Art. [An outbreak of *I. laminatus* on *P. tremula*, with some observations on the biology of the species and on its honeydew.] *Anz. Schädlingssk.* 30 (10), 1957 (165-9). 19 refs. [G.]

2025. KARAFIAT, H. Neue Wege der Populationsanalyse an rindenbewohnenden Arthropoden. [New methods of analysing populations of bark-inhabiting arthropods.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl. No. 83*, 1955 (90-1). [G.]

Describes the comparison, over a period, of *Adelges piceae* populations on 3 rectangular patches on a stem, of which one was unprotected, another enclosed in a wire cage allowing the entry of other insects, and the third enclosed in an insect-proof wire cage, by (a) a series of Leica photographs, and (b) recording on a ruled sheet, with the help of a grid placed over the patch and a pair of binoculars on a stand, the position of each individual.

2026. KARAFIAT, H. Zur Methodik der Massenwechsel-Untersuchung an sessilen Arthropoden. [A method of studying fluctuations in population of sessile arthropods.] *Z. PflKrankh.* 64 (11), 1957 (663-76). 6 refs. [G.g.e.] E.M.B.

A rather fuller account [see preceding abstract], with detailed descriptions and illustrations of equipment used, of a method of studying development and survival of individuals of *Adelges piceae* on small plots of bark, by serial mapping, using a wire-gauze cage to exclude predators, binoculars and portable lighting, and a pantograph for recording.

2027. KARAFIAT, H., and FRANZ, J. Studien zur Populationsdynamik der Tannenstammlaus *Adelges (Dreyfusia) piceae* (Ratz.) (Hemipt., Adelgidae). [Studies of population fluctuations in *A. piceae*.] *Zoologische Jahrbücher (Abteilung für Systematik, Ökologie und Geographie der Tiere)*, Jena 84 (6), 1956 (467-504). 22 refs. [G.g.e.] O.R.S.

Describes in detail quantitative studies of *A. piceae* on *Abies alba*.

2028. FRANZ, J. Natürliche Feinde und Nährpflanze als biozönotische Begrenzungsfaktoren bei Gradationen der Tannenstammlaus, *Adelges (Dreyfusia) piceae* (Ratz). [Natural enemies and

host plants as biocoenotic limiting factors in epidemics of *A. piceae*.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl. No. 85*, 1956 (27-30). 5 refs. [G.g.]

The life history of *A. piceae* populations on the stem of an 80-year-old Silver Fir were compared when (a) completely protected by a wire cage, (b) in a wire cage allowing access by predators, and (c) in the open. There was little difference in the 3 populations until the end of August, when (b) and (c) were noticeably reduced by predators. While a gradual diminution of aphid density, following bark exhaustion, was common to all, the protected populations persisted for a year or more after the mass infestation had disappeared from the rest of the stem, indicating that under natural conditions both host reactions and predators contribute to its collapse.

2029. POPE, R. B. The role of aerial photography in the current Balsam woolly aphid outbreak. *For. Chron.* 33 (3), 1957 (263-4). 1 ref.

Makes suggestions for increased use of aerial photography in locating outbreaks, assessing their intensity, estimating amount of timber killed and damaged, tracing trends of outbreaks, and determining the types of stand attacked.

2030. BRADLEY, G. A. Aphids of the genus *Cinara* Curtis in Canada. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (5), 1957 (1).

Seven species not previously found in Canada have been identified and are listed with their hosts (*Picea glauca*, *P. engelmannii*, *Pinus monticola*, *P. contorta* var. *latifolia*, *P. banksiana*, *Abies grandis* and *Juniperus scopulorum*).

2031. TAMBS-LYCHE, H. Bladlusangrepene på sitka-gran. [Aphis attack on Sitka Spruce.] *Norsk Skogbr.* 3 (18), 1957 (470, 473). [Nor.]

A number of outbreaks of *Liosomaphis [Neomyzaphis] abietina* have been reported from Vestland. Slight attacks were found on Norway Spruce, which may have been the original host. The insect and the damage are described.

2032. BORATYŃSKI, K. On the two species of the genus *Carulaspis* Macgillivray (Homoptera: Coccoidea, Diaspidinae) in Britain. *Ent. mon. Mag.* 93 (1121), 1957 (246-51). 18 refs.

Includes diagnoses, life histories and drawings of *Carulaspis juniperi* and *C. minima*, the former found on *Chamaecyparis lawsoniana* and *C. nootkatensis*, *Cupressocyparis leylandii*, *Cupressus* spp., *Juniperus communis* var. *hibernica* (but not on indigenous *J. communis*), *J. sinensis* and *J. virginiana*, *Libocedrus decurrens*, *Sequoia gigantea* and *Thuja occidentalis*. *C. minima* has been found only at Kew (on *J. virginiana*, *T. occidentalis* and *C. lawsoniana*). The material examined yielded no hymenopterous parasites.

2033. SĂVESCU, A. Die Linden-Kommaschildlaus. [*Lepidosaphes tiliae* sp.n.] *Anz. Schädlingssk.* 30 (12), 1957 (197-201). [G.]

A description of the life history and habits of *L. tiliae*, found in Rumania exclusively on Lime. Successful control of 1st-instar larvae was effected



with sprays of parathion or of ICAR, an unspecified oil-emulsion formula of the Agricultural Research Institute at Bucharest.

### Lepidoptera

See also Nos. 1331, 2006-8, 2011, 2015-6, 2020, 2155.

2034. WEBB, F. E. Sampling techniques for the overwintering stage of the Larch casebearer [*Coleophora laricella*]. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (1-2).

Sampling techniques have been developed for the measurement of populations in the lower crown. A sequential sampling system is described [cf. *F.A.* 16 No. 1976], by which overwintering populations are classified at 3 levels of infestation. A table was constructed to show the various combinations of samples per tree and numbers of trees required to define overwintering populations, and another showing optimum number of samples per tree for different ratios of time taken in moving from tree to tree to time taken to collect a sample within the tree. Another table has been constructed for counters using sequential sampling, showing cumulative numbers of overwintering casebearers per 100 buds. The methods are applicable to other insects.

2035. OHNESORGE, B. Die Prognose von Fichtennestwicklerschäden (*Epiblema tedella* Cl.). [Prediction of damage by *E. tedella*.] *Z. Pfl-Krankh.* 64 (7/10), 1957 (550-4). 2 refs. [G.g.e.] E.M.B.

Prediction is based on the population density in the egg or early larval stages, the food demand of a single caterpillar (about 40 needles), and the quantity of needles on the trees.

2036. MARTELLI, G. La gemmaiola del pioppo. [The Poplar budworm.] *Giornale d'Italia Agricola, Roma* No. 26, 1957. [It.] From *abstr. in Ital. agric.* 7 (94), 1957 (ii-iii). E.M.B.

Poplar nurseries in Italy are often infested by a *Gypsonoma* sp. causing malformations of buds and leaders. It has been wrongly identified with *G. neglectana*, but differs in having two generations in the year instead of one. Control by picking off infested buds or spraying with a mixture of DDT and parathion is recommended.

2037. POSTNER, M. Die Massenvermehrung des Fichtenrindenwicklers (*Laspeyresia pactolana* Zbl., Tortricidae) in Süddeutschland. [The epidemic of *L. pactolana* in S. Germany.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 83, 1955 (95-9). 17 refs. [G.]

Discusses present distribution of infested areas (largely on the Swabo-Bavarian plateau at 500-600 m. alt.) in relation to climatic data, and the effect of frost, drought, game etc. on the susceptibility of the host. Lachnid-infested plantations suffered particularly. Young plants injured by *L. pactolana* were often killed by adventitious pests, e.g. *Magdalis* and *Pityogenes* species. Control by systemic poisons and silvicultural measures is discussed. [Cf. *F.A.* 18 No. 1870.]

2038. BERGER, H., and CRAMER, H. H. Trieb-schädigungen in Kiefern-Jungwüchsen. [Shoot injuries in young Pine plantations.] *Holz-Zbl.* 83 (126), 1957 (1543-5). 3 refs. [G.]

Describes the nature, extent and distribution of damage by *Rhyacionia buoliana*, *R. turionana*, *Heringia dodecella*, *Thecodiplosis brachyntera*, *Cecidomyia baeri*, and *Brachyderes incanus*, and of *Lophodermium pinastri* and *Melampsora pinitorqua* in S.W. Germany, discussing their relative importance, bionomics, and effect of the weather, particularly with regard to the possibility of combined control operations, aimed, however, primarily at *R. buoliana*. Knapsack spraying in July with 2% DDT/BHC mixture, 1% toxaphene and 0.1% E 605 [parathion] successfully reduced the % of injured shoots to 7, 25 and 13 respectively, compared with 46 in an untreated plot, but timing was difficult. Helicopter spraying in August with the systemic insecticide Dipterex, combined with Dithane [nabam] for the simultaneous control of *L. pinastri*, resulted in 46% kills of *R. buoliana* and other insects, when the area was treated twice in rapid flight with 4 or 2 kg./ha; but when the aircraft flew slowly once, to obtain greater penetration of the fungicide through rotor pressure, the shoots were not wetted sufficiently at 4 kg./ha. The critical time in August was longer but, because of higher costs and the damage to shoots that had already occurred, July treatment is thought preferable (where feasible), except when there is a large population of predators and parasites, which are more susceptible in July.

2039. BECKWITH, L. C. Weather station records not an accurate guide to temperatures lethal to the shoot moth [*Rhyacionia buoliana*]. *Tech. Note Lake St. For. Exp. Sta.* No. 508, 1957. pp. 2.

In plantations near Cadillac, Mich., the average daily temperature (from data over a 5-year period) was found to be 6.5° higher than at the local weather station. The spread of *R. buoliana* is now considered unlikely to be checked by low winter temperature in this area.

2040. GREEN, G. W., BALDWIN, W. F., and SULLIVAN, C. R. The use of radioactive cobalt in studies of the dispersal of adult females of the European Pine shoot moth, *Rhyacionia buoliana* (Schiff.). *Repr. from Canad. Ent.* 89 (8), 1957 (379-83). 1 ref.

Describes the successful use of Co<sup>60</sup> on adults of the European Pine shoot moth. The tagged ♀s proved capable of normal flight, and, as far as could be established in this study, the Co<sup>60</sup> had no effect on their behaviour, life expectancy or reproductive processes.

2041. QUEDNAU, W. Über den Einfluss von Temperatur und Luftfeuchtigkeit auf den Eiparasiten *Trichogramma cacoeciae* Marchal. (Eine biometrische Studie). [The influence of temperature and air humidity on *T. cacoeciae* (a biometrical study).] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 90, 1957. pp. 63. 47 refs. [G.g.e.]

Discusses laboratory methods and results of a study of development, mortality, fertility, diapause,

life span etc. in connexion with the use of the parasite for biological control of budworm. Optimum temperature for imago was ca. 28–29° C., with markedly reduced oviposition if temperature remained long below 15°. Hibernation was possible only in a diapause in an early pre-pupal stage, the late pre-pupal and pupal stages being sensitive to cold.

2042. HARVEY, G. T. The occurrence and nature of diapause-free development in the Spruce budworm, *Choristoneura fumiferana* (Clem.) (Lepidoptera: Tortricidae). Repr. from *Canad. J. Zool.* 35, 1957 (549–72 + 4 photos). 27 refs. [Cf. *F.A.* 16 No. 1383.]

2043. THOMSON, H. M. A note on the predation of Spruce budworm pupae. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (2).

Considerable predation of Spruce budworm pupae was observed in Uxbridge Forest, Ont., in 1956. An examination was made at random on 400 pupal sites, and 18.2% of pupae were found to be attacked. *Dioryctria reniculella* (the Spruce coneworm) was the commonest single predator (5.8%), but 2.5% were attacked by 6th-instar Spruce-budworm larvae.

2044. MORRIS, R. F. The interpretation of mortality data in studies on population dynamics. Repr. from *Canad. Ent.* 89 (2), 1957 (49–69). 30 refs.

Examines current misconceptions in conjunction with some life-table data for *Choristoneura fumiferana*.

2045. CHILDERHOSE, R. J. The budworm situation in New Brunswick. *Timber of Canada* 18 (9), 1957 (54...58, 101).

Describes the early work, the (non profit-making) Forest Protection Ltd., the policy of a holding control of epidemics, the organization and methods of aerial spraying, costs, and the possible discouragement of financial backers (Federal and Provincial Governments and 4 leading pulp companies).

2046. FRANZ, J. Ein Vergleich des europäischen und des nordamerikanischen Tannentriebwicklers (*Choristoneura murinana* (Hb.) und *C. fumiferana* (Clem.)). [A comparison of the European and American species, *Cacoecia murinana* and *C. fumiferana*.] *Z. PflKrankh.* 64 (7/10) 1957 (578–84). 17 refs. [G.g.e.] E.M.B.

The two species are very similar in morphology, bionomy, behaviour and enemies. Differences in their main food plants *Abies alba* and *A. balsamea* (e.g. in position and abundance of ♂ flowers), and in the behaviour of the insects in mining buds and needles after hibernation, are responsible for differences in gravity of attack.

2047. SCHÜTTE, F. Untersuchungen über die Populationsdynamik des Eichenwicklers (*Tortrix viridana* L.). [The population dynamics of *T. viridana*.] Repr. from *Z. angew. Ent.* 40 (1; 3), 1957 (1–36; 285–331). 88 refs. [G.g.e.]

A report on a detailed investigation in 4 stands near Munster: (A) pure Oak, Sessile and Pedunculate; (B) and (C) Oak and Hornbeam, (B) without

and (C) with nest-boxes; and (D) Oak (all Pedunculate, aged 85–115 years) with Spruce. Methods of sampling, counting and computing population densities are described and their reliability discussed. An aerial column with a cross-section of 1 sq. m. was chosen as a unit of assessment, and sample branches were taken from 3 parts of the crown of 10 trees during 3 seasons. The influence of bionomic factors, weather, and enemies were studied. Weather had little direct effect on densities, most stages being well protected, but lack of coincidence between hatching dates and time of optimum bud development was the greatest single mortality factor. The effect of various temperature fluctuations on bud and insect development was studied experimentally. The relative influence of different predators and parasites on population fluctuations was analysed by various methods. Though pupal mortality is significantly greater in (C) than in (B), no clear influence of bird population densities on insect fluctuations emerged—possibly because of the great complexity of predator relationships and other mortality factors, notably the results of over-population. Many carabid beetles and the larvae of *Epinotia corticana* were important predators, particularly of caterpillars compelled to leave defoliated trees. The interplay of the various mortality factors and particularly the effects of coincidence or non-coincidence between hatching and flushing are discussed. Populations fluctuated considerably less in (A), in which early, middle and late flushes were fairly evenly distributed, than in (B) and (C) (intermediate) and (D) (late), though (A) was the only pure stand, a factor generally thought to increase susceptibility. It is suggested that a mixing of phenological types might help to avoid severe outbreaks.

2048. MACRAE, C. Some observations on *Tortrix* defoliation. *Quart. J. For.* 51 (4), 1957 (332–3 + 2 photos). 2 refs.

During severe defoliation of *Quercus sessiliflora* in Roudsea Wood, it was noticed that several trees were almost untouched, though *T. viridana* caterpillars were present in their crowns and in some cases the crowns were touching those of defoliated trees. The resistant trees were marked, with a view to acorn collection, and in the following spring it was noted that they all flushed 10–20 days earlier than the rest of the stand.

2049. VICLEA, V. L'emploi de l'aviation dans la lutte chimique contre les insectes nuisibles aux forêts de Roumanie. [The use of aircraft in the chemical control of insect pests in Rumanian forests.] *Rev. int. Bois* 24 (231/232), 1957 (147–50). [F.]

Deals chiefly with aerial spraying against *Tortrix viridana* and *Lymantria* spp., using different rates of Nitroxane (1.5% γBHC), either alone or in combination with DDT.

2050. Biological control (virus disease in bagworms). Repr. *Wattle Res. Inst. S. Afr.* 1956/57, 1957 (24).

Plantations sprayed with polyhedral virus in 1955 showed in 1957 very few bagworms, compared with somewhat higher populations in adjacent controls,



and still more further away. In 1956, the former unnecessarily high concentrations, with a minimum of 10,000 polyhedra per cu.mm. were reduced to 1000–10,000. The 40-ft. trees were sprayed with a 'Bean' fire-fighter at a nominal 6 gal./acre, some shortly before the hatching, others when larvae were 2–3 weeks old. Spray-dried milk powder (0.5%) was added to some suspensions as a sticker. Interim assessments suggest a high mortality where crowns were evenly treated, and reduced feeding vigour by fully developed larvae where crowns were incompletely treated. Comparable controls were partially or completely defoliated. Virus from remote plantations appeared more lethal than that locally collected.

2051. WEBB, D. v. V., and KNOESEN, J. G. **Wattle bagworm can be exterminated.** *Fmg. S. Afr.* 33 (7), 1957 (42–4). E.M.B.

Reports on comparative tests with sprays of endrin and toxaphene in dieselene. Large-scale aerial spraying with 0.5% endrin/dieselene is recommended at 2–3 gal./acre, a dosage considered to be safe for animals.

2052. BUCHER, G. E. **Disease of the larvae of tent caterpillars caused by a spore-forming bacterium.** *Canad. J. Microbiol.* 3 (5), 1957 (695–709 + 3 plates). 5 refs. Smry. O.R.S.

A newly discovered bacterial disease infected laboratory populations of *Malacosoma pluviale* in all instars. *M. americana* is also susceptible but *M. disstria* is resistant.

2053. JANKOVIĆ, L. **Neka zapažanja iz ekologije gubara (*Lymantria dispar* L.) u brdskim i planinskim šumama kod nas.** [Some observations on the ecology of *L. dispar* on hills and mountains with forest cover in Yugoslavia.] *Zborn. Rad. Inst. Ekol. Biogeogr., Beograd* 7 (8), 1956. pp. 20. 10 refs. [Serb.e.e.]

From observations on the Kopaonik and Mokra Gora mountains, Serbia, data are given on the effect of altitude, aspect and climate on the population density of *L. dispar*.

2054. O'DELL, W. V. **Status of the co-operative Gypsy Moth program [U.S.A.] September 30, 1956.** *J. econ. Ent.*, 50 (5), 1957 (541–3).

The worst recorded outbreak of *Lymantria dispar* defoliated nearly 1.5 million acres of New England woodlands in 1953, much of it new territory. The spread of infestation and subsequent action taken, past accomplishments in control, the beginning of an accelerated control and survey programme, the status of infestation in 1956, and plans for 1957 are detailed. Extensive trapping shows that large-scale spraying with DDT (1 lb./gal.) has been very successful. [Cf. *F.A.* 17 No. 634.]

2055. WALLIS, R. C. **Incidence of polyhedrosis of gypsy-moth larvae and the influence of relative humidity.** *J. econ. Ent.* 50 (5), 1957 (580–3). 30 refs.

This disease appeared in 538 colonies, developed from egg masses collected (1953–56), in 10 localities and on widely varying sites, in Connecticut. Orally administered 'stressors' (hydroxylamine and  $\text{KNO}_3$ ) only slightly increased disease incidence. A field

study of an epizootic in 1956, confirmed by laboratory tests, showed little disease in larvae during a fortnight of low relative humidity but a sharp rise when r.h. was high. *From author's summary.*

### Coleoptera

See also Nos. 1332–5, 2001–2, 2038.

2056. PALM, T. **Bidrag till kännedomen om svenska skullbaggars biologi och systematik.** 18. Två intressanta anobiider i grenved av ek. [Biology and taxonomy of Swedish Coleoptera. 18. Two interesting Anobiidae in Oak branchwood.] *Entomologisk Tidskrift, Stockholm* 77 (2/4), 1956 (154–6, 157). 1 ref. [Sw.g.] O.R.S.

*Xyletinus pectinatus* and *Oligomerus brunneus*.

2057. KAMP, H. J. **Buchenprachtkäfer-Kalamität auf der Schwäbischen Alb.** [The outbreak of *Agrilus viridis* on the Schwäbische Alb [S. Württemberg].] *Allg. Forstzeitschr.* 11 (2), 1956 (26–9). [G.]

Reports observations during 1951–53 in heavily infested Beech stands, on bionomics; effect of weather, site and host conditions on incidence; enemies, including 10 parasites new for the species; silvicultural measures; and control, chiefly the felling of infested trees and trap trees with or without poison.

2058. MORRIS, R. C. **Leaf beetle damages Cottonwood trees in Delta.** *Information Sheet, Mississippi Agricultural Experiment Station, State College, Miss.* No. 537, 1956. pp. 2.

An infestation of *Chrysomela scripta* in nurseries and a plantation is described. The beetles were readily controlled in the nursery by spraying with endrin or dieldrin.

2059. BRERETON, J. LE G. **Defoliation in rain forest.** *Aust. J. Sci.* 19 (5), 1957 (204–5). 9 refs. O.R.S.

In the subtropical rain-forest at Dorriggo, 67 miles E. of Armidale, very severe defoliation of *Laportea gigas* by *Galerucella laporteeae* was observed in 1956. The number of tree species in rain-forest on similar sites in Australia is small and this may predispose it to attack by pests, or there may have been some upset to the stability of the community.

2060. GURR, L. **A note on the occurrence of the Eucalyptus tortoise beetle (*Paropsis dilatata* Er.) in the North Island [of New Zealand].** *N.Z. J. Sci. Technol.* 38A (8), 1957 (807). 4 refs. P.R.

The pest is now well established in the North Island and spreads rapidly.

2061. MATHUR, R. N. ***Ailanthus excelsa* Roxb., a new host of *Batocera rufomaculata* de Geer (Coleoptera: Lamiidae).** *Indian For.* 83 (9), 1957 (563–4 + 3 photos). 10 refs.

2062. ENE, M., and TUDOR, I. **Contribuții la cunoașterea și combaterea insectei *Phymatodes testaceus* L. [*P. testaceus* and its control]** *Rev. Pădurilor* 1957 (10), (648–56). 32 refs. [Rum.]

A detailed account of the morphology and life history of the insect, damage, and methods of control.

2063. GARDINER, L. M. **Deterioration of fire-killed Pine in Ontario and the causal wood-boring beetles.** *Repr. from Canad. Ent.* 89 (6), 1957 (241-63). 21 refs.

Field studies were made during 1949-51, in a fire-killed stand in Mississippi, of the wood-boring insects attacking the timber. Notes are presented on the Cerambycidae found in White, Red and Jack Pine, with a key to their larvae. By far the greatest damage was done by larvae of *Monochamus* spp. The effects of the fire (both direct and indirect) varied greatly with the tree species. Jack Pine succumbed very readily to burning, followed by White and then Red Pine. Other things being equal, infestation was heavier in White Pine than in Red, and larval penetration was deeper. Trees burned most severely were attacked first, and should therefore be salvaged first. Trees suffering only slight injury were generally free from serious damage for at least a year, and may survive to be used as seed-trees.

2064. OSTRANDER, M. D., and STOLTENBERG, C. H. **Value loss from weevil-caused defects in Eastern White Pine lumber.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 73, 1957. pp. 2.

From a study of log grades of 400 logs, tabulated data show the loss in lumber value resulting from injuries by *Pissodes strobi*, estimated per 1000 bd. ft. according to the number of injuries per log.

2065. SCHVESTER, D., and BIANCHI, H. *Cryptorhynchus lapathi* L. (Coleoptera, Curculionidae), ravageur des osiers cultivés. [*C. lapathi*, a pest of cultivated Osiers.] *Ann. Épiphyt.* 8 (2), 1957 (137-51). 12 refs. [F.f.] E.M.B.

Reports for the first time in France (in the region of Lyons) an infestation of Osiers by *C. lapathi*, a well known pest of Poplar. The damage is inflicted by the feeding imago and among other things has an adverse effect on the flexibility of the osier rods. The most susceptible species is probably *Salix americana*. Information is presented on the biology and life history of the insect and on its hosts outside France. Attempts at chemical control were ineffective, probably because of the thick and bushy nature of the vegetation.

2066. PETERSEN, B. B. Stormfald og insekt-skader. [Insect damage in relation to windthrow and breakage.] *Dansk Skovforen. Tidsskr.* 42 (4), 1957 (226-36). 9 refs. [Dan.]

Discusses Swedish studies [see *F.A.* 16 No. 4334] in relation to conditions in Denmark and makes some recommendations on control.

2067. NUORTEVA, M. Zur Kenntnis der parasitischen Hymenopteren der Borkenkäfer Finnlands. [Notes on the hymenoptera parasitic on Finnish barkbeetles.] *Repr. from Annales Entomologici Fennici, Helsinki* 23 (2), 1957 (47-71). 43 refs. [G.]

Discusses life history, distribution, taxonomy, hosts etc. of 28 species, of which 5 braconids and 6 chalcids are new to Finland. Their relationship to 38 species of barkbeetles is tabulated.

2068. NUORTEVA, M. *Ips amitinus* Eichh. kaarnakuoriaisen esiintymisestä Suomessa. [The

occurrence of *I. amitinus* in Finland.] *Repr. from Annales Entomologici Fennici, Helsinki* 22 (4), 1956 (168-70). 3 refs. [Fi.g.]

This beetle, whose occurrence in Finland has only recently been reported [cf. *F.A.* 18 No. 1265] has been found by the author in all parts of the country investigated, chiefly in felled tops of Spruce and Pine. The bionomics, breeding galleries, symbionts and parasites of this secondary pest are described. *From author's summary.*

2069. SCHENK, J. A., DOSEN, R. C., and BENJAMIN, D. M. **Noncommercial thinning of stagnated Jack Pine stand and losses attributable to bark beetles.** *J. For.* 55 (11), 1957 (838-41). 8 refs.

A 30% thinning was made in a 16-year plantation of *P. banksiana* in central Wisconsin in 1954 and in 1955, and a 50% thinning in a 28-year natural stand near by; in both, the slash was left in order to determine whether the barkbeetle population would increase to dangerous levels in it, and then attack the residual stand. After one year the loss to the plantation from barkbeetles was assessed at 0.5% of the residual stand, i.e. the same as for an adjacent unthinned control plot, the attack on the slash proving negligible. In the natural stand, the slash showed an infestation of 21% at the end of the season, and the residual stand a loss of 1.5%, while that of the control plot averaged 5%. The lower figure for the thinned plot is attributed to the removal of many suppressed and damaged trees. It is considered that temperature and rainfall may be important in determining insect populations during and after thinning operations. Of trap boards painted in six colours, yellow caught the most beetles.

2070. REID, R. W. **The bark beetle complex associated with Lodgepole Pine slash in Alberta. Part II. Notes on the biologies of several hymenopterous parasites.** *Repr. from Canad. Ent.* 89 (1), 1957 (5-8). 4 refs.

Describes representatives of the families Braconidae and Pteromalidae found in association with broods of *Ips pini* and *Ips perroti* [cf. *F.A.* 17 No. 2422].

2071. REID, R. W. **The bark beetle complex associated with Lodgepole Pine slash in Alberta. Part III. Notes on the biologies of several predators with special reference to *Enoclerus spegheus* Fab. (Coleoptera: Cleridae) and two species of mites.** *Repr. from Canad. Ent.* 89 (2), 1957 (111-20). 5 refs.

Notes on the most important predators of *Ips pini* and *I. perroti* [cf. preceding abstract].

2072. WERNER, A. E., and GRAHAM, K. **Volatile wood constituents in relation to ambrosia beetles.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (3).

The two major constituents of gas-distilled extracts from both attractive and non-attractive wood have been identified as  $\alpha$ - and  $\beta$ -pinene, present in proportions of 12:1. *Trypodendron lineatum* adults failed to attack bark surfaces treated with  $\alpha$ - or  $\beta$ -pinene or with extracts from new wood containing large amounts of these substances. [Cf. *F.A.* 17 No. 4218.]



2073. **Ambrosia beetle attack on poisoned trees.** *Rep. W. Afr. Timb. Borer Res. Unit 1953/55, 1957* (31).

Trees poisoned by applying a 6.5% aqueous solution of Na arsenite after frill girdling were heavily attacked by ambrosia beetles immediately after application, the first attack being confined to the girdling cuts and adjacent areas. The beetles were unaffected by the Na arsenite and penetrated through it to establish galleries in the bole. Scolytidae formed the bulk of the initial attack.

2074. SCHWERTFEGER, F. Massnahmen zur Bekämpfung der *Dendroctonus*-Epidemie in den Kiefernwäldern Guatemalas. [Means of controlling the *Dendroctonus* outbreak in the Pine forests of Guatemala.] *Z. Pflkrankh.* 64 (7/10), 1957 (584-8). [G.g.e.] E.M.B.

The following measures for controlling *Dendroctonus* (mainly *D. adjunctus*) are suggested: (1) control of logging; (2) planting species other than *Pinus rudis*, the only species attacked; (3) barking infested trees after the adult beetles have flown, and destroying the bark; (4) girdling trees during the period of egg-laying, or felling them and leaving them with bark intact; (5) use of trap trees. [Cf. *F.A.* 17 No. 4226.]

2075. MOORE, A. D. The relative toxicity of DDT, toxaphene, lindane, and isodrin to *Dendroctonus brevicornis* Lec. and *Ips confusus* (Lec.). *J. econ. Ent.* 50 (5), 1957 (548-50). 3 refs.

Tabulates data on mortality in adults 72 hours after application to the thoracic sterna of various concentrations of the insecticides; doses 50 and 90% lethal in  $\mu\text{g./mg.}$  mean body weight; and relative potency of the poisons. For *D. brevicornis* this last was isodrin > lindane > DDT > toxaphene. For *I. confusus*, the positions of isodrin and lindane were reversed. Probit regression lines for mortality/dosage are parallel for lindane, DDT and toxaphene; for isodrin the slope is steeper for both insects. The aim of this study is to find a residual insecticide more satisfactory than the present control methods of burning or the use of penetrating oil sprays, and one that also protects valuable timber as yet unattacked.

2076. ATKINS, M. D. A study of the effect of nematodes and mites on Douglas-Fir beetle flight. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (5), 1957 (2-3).

The effect of parasitic nematodes and mites on the flight capacity and response to flight stimulation of *Dendroctonus pseudotsugae* was tested and found to be insignificant.

2077. EATON, C. B. Jeffrey Pine beetle [*Dendroctonus jeffreyi*]. *For. Pest Leaflet. U.S. For. Serv.* No. 11, 1956. pp. 7.

2078. THOMAS, G. M. Climate and growth rate as related to an outbreak of Silver Fir beetles [*Pseudohylesinus grandis* and *P. granulatus*]. *Res. Note Pacif. Northwest. For. Range Exp. Sta.* No. 150, 1957. pp. 5.

A study of climatic data showed that unusually hot dry summers occurred before and during an outbreak

of *Pseudohylesinus* spp. in *Abies amabilis* stands in N.W. Washington in 1947. No correlation was established between tree growth and climatic conditions.

2079. SCHWERTFEGER, F. Scolytidae (Col.) an *Pinus*-Arten in Mittelamerika. II. Die Gattungsgruppe Pityophthorini. [Scolytids on Pines in Central America. II. The genus-group Pityophthorini.] *Repr. from Z. angew. Ent.* 40 (4), 1957 (494-508). 7 refs. [G.g.e.]

Describes 7 species of *Pityophthorus*, one of *Ctenophthorus* and one of *Conophthorus* (6 of them new), their morphology, ecology, bionomics etc. [Cf. *F.A.* 18 No. 4349.]

2080. STEVENS, R. E. Fir engraver beetle [*Scolytus ventralis*]. *For. Pest Leaflet. U.S. For. Serv.* No. 13, 1956. pp. 7. 1 ref.

2081. FINNEGAN, R. J. Elm bark beetles in southwestern Ontario. *Repr. from Canad. Ent.* 89 (6), 1957 (275-80). 27 refs.

Notes on the seasonal history and habits of *Scolytus multistriatus* and *Hylurgopinus rufipes*.

2082. SCHVESTER, D. Contribution à l'étude des coléoptères scolytides: essai d'analyse des facteurs de fluctuation des populations chez *Ruguloscolytus rugulosus* Muller 1818. [Contribution to a study of the Scolytidae: analysis of the factors in fluctuations of population of *Scolytus rugulosus*]. *Ann. Épiphyt.* 8 (Spec. No.), 1957. pp. 162. 5 pp. of refs. [F.] E.M.B.

A comprehensive account, based on laboratory and field studies, and covering the biology of the insect and factors influencing fluctuation (physical factors of the environment, density of populations, physiological condition of the host, and natural enemies). The insect occurs mainly on fruit trees, but has also been found on *Alnus*, *Betula*, *Corylus*, *Crataegus*, and *Ulmus* spp.

## Hymenoptera

See also Nos. 1336, 2155.

2083. BIRD, F. T., and ELGEE, D. E. A virus disease and introduced parasites as factors controlling the European Spruce sawfly, *Diprion hercyniae* (Htg.), in central New Brunswick. *Repr. from Canad. Ent.* 89 (8), 1957 (371-8). 11 refs.

A virus disease and introduced parasites have been important factors in controlling this sawfly in central New Brunswick. The virus has been very effective at high, and certain parasites very effective at low, host densities. Some species of parasite (e.g. *Dahlbominus fuscipennis* and *Exenterus claripennis*) that showed ability to cause important mortality at high population levels have been replaced by other species (e.g. *Drino bohemica* and *Exenterus vellicatus*) more effective at low population levels. Until recently the effectiveness of the virus has appeared to be dependent on density and to be independent of stress factors such as weather, overcrowding, and lack of food. There have been indications lately of an increase in resistance of the sawfly to the virus.

2084. EWAN, H. G. **Jack Pine sawfly** [*Neodiprion pratti banksianae*]. *For. Pest Leaflet*. U.S. For. Serv. No. 17, 1957. pp. 4. 4 refs.

2085. NIKLAS, O. F., and FRANZ, J. Begrenzungsfaktoren einer Gradation der roten Kiefernbuschhornblattwespe (*Neodiprion sertifer* [Geoffr.]) in Südwestdeutschland 1953 bis 1956. [Factors limiting an outbreak of *N. sertifer* in S.W. Germany, 1953-56.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 89, 1957. pp. 39. 81 refs. [G.g.e.]

The role of biotic and abiotic mortality factors in an outbreak in 8- to 12-year-old Pine plantations near Darmstadt, which reached its height in 1953, was studied from 1952 to 1956 by various methods (free, 'frame' and 'bag' counts), which are described. Mortality was small in the egg stage, high in the early larval stages if temperatures were near 0° C., and very high among full-grown larvae, owing to a polyhedral virosis. Few cocoons were attacked by parasites (only 4 species were identified). Small mammals destroyed a great many, increasingly so as better light conditions in the defoliated stands stimulated grass growth which, in turn, favoured the small mammals. Adult mortality was low. Numbers of eggs per ♀ varied little, but numbers of eggs per shoot, greatly. The ♀s tended to avoid defoliated trees and to prefer vigorous ones.

2086. BRUNS, H. Vögel und Waldameisen als Vertilger von Fichtenblattwespenlarven. [The destruction of larvae of *Pristiphora abietina* by birds and wood ants.] *Allg. Forstzeitschr.* 11 (10), 1956 (143-4). 12 refs. [G.g.]

Includes a comparison of tabulated data on quantities caught by various birds (from older literature) and by a young colony of *Formica rufa* (from his own observations) and concludes that the main importance of both lies in preventing rather than controlling mass outbreaks, though the numbers destroyed by ants are so great that they may influence even large populations.

2087. PETERSEN, B. B. Bladhvespen *Lygaeonematus abietinus* Christ som skadedyr på rødgran i Sønderjylland. [*Pristiphora abietina* on Norway Spruce in S. Jutland.] *Forstl. Forsøgsv. Danm.* 22 (2), 1957 (275-355 + 3 plates). 31 refs. [Dan.dan.e.]

A heavy attack in the Bommerlund plantation was studied in 1949-54. The mean annual loss of increment on 560 ha. was estimated at 1340 cu.m. (valued at Kr. 27,000). Defoliation decreased by about  $\frac{2}{3}$  in 1950-53 and then remained constant till 1954. Spraying or dusting from the air gave good control in 1949-50, 15 litres/ha. of 1.5% parathion giving the best kill, viz. 91% of the larvae; 10 kg./ha. of 0.6% derris was less effective (67%); and 20 litres/ha. of 5% quassia was unsatisfactory (14%). The Dutch 'Wervelwind' combined mist-sprayer and dust-blower was used with parathion, Bladan [a thiophosphate preparation] and derris. A higher rate of insecticide (35-50 kg. powder/ha.) was needed than for aerial spraying. The range for mist spraying was 30 m. and for dusting 100 m. with the effect perceptible for another 100 m. The method is not suitable for stands of trees > 20 m. high. A

fairly strong steady wind improves results. In laboratory experiments with eggs and larvae, parathion was the cheapest and most effective of a number of chemicals tested, followed by DDT and  $\gamma$ BHC costing 5-6 times as much. Derris and pyrethrum at an effective rate cost 25, Systox [E1059] 45 and Octachlor [chlordane] 125 times as much as parathion. The life history of the insect is described in detail and other *Pristiphora* spp. found in the area are more briefly discussed.

2088. KÜHNER, D. J., and HEIMPEL, A. M. Lecithinase production by strains of *Bacillus cereus* Fr. and Fr. pathogenic for the Larch sawfly, *Pristiphora erichsonii* (Htg.). *Canad. J. Microbiol.* 3 (3), 1957 (547-51). 12 refs. O.R.S.

Strains of *B. cereus* pathogenic for *P. erichsonii* produce an enzyme that breaks down purified egg lecithin and the phospholipids of egg yolk and insect tissue. A study, using specific chemical techniques to measure the lecithinase activity, of the relation between lecithinase production and pathogenicity supports an earlier postulate [see F.A. 17 Nos. 662-3, 1818] that lecithinase plays a role in the pathogenicity of *B. cereus* for *P. erichsonii*. *Authors' summary.*

2089. WONG, H. R. Sawflies of the genus *Platycampus* Schiodte on Trembling Aspen in the Canadian prairies. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (4), 1957 (2).

Two species found feeding on the foliage of *Populus tremuloides* have been tentatively identified as *Platycampus americanus* and *P. albostigmus*.

2090. HUSSEY, N. W. *Megastigmus* species (Hym. Torymidae) associated with seeds of Silver Fir and Cedar. *Ent. mon. Mag.* 93 (1121), 1957 (252-3). 4 refs.

Continuing his descriptive system [see F.A. 16 No. 3234] the author lists the characters differentiating *M. suspectus* from *M. bornmülleriana* sp. nov. on *Abies bornmülleriana* (N. Turkey), *M. schimitscheki* on *Cedrus libani* (Taurus Mts.) and *C. brevifolia* (Paphos, Cyprus), and *M. suspectus* var. *pinsapo* on *Abies pinsapo* (Spain) and *Cedrus atlantica* (France). All are seed infestors.

2091. HUSSEY, N. W. The life-histories of *Megastigmus spermotrophus* Wachtl (Hymenoptera: Chalcidoidea) and its principal parasite with descriptions of the developmental stages. *Transactions of the Royal Entomological Society, London* 106 (2), 1955 (133-51). 20 refs. I.I.E.

Includes a description of the developmental stage of Douglas Fir cones at the time of attack, the effect of the weather on cone parasitization due to greater temperature sensitivity of the chalcid (from observations in the U.K.), results of experiments on the effects of temperature and moisture on diapause, a key to 3 pteromalid parasites, and a description of *Amblymerus apicalis*.

2092. TAYLOR, W. A., and DUFF, G. M. S. Penetration of insecticidal smokes into model nests. *World Crops* 9 (11), 1957 (444-6). O.R.E.

Tests with glass and earth models of leaf-cutter



ants' nests, using fast-reacting BHC smoke-mixture pellets, were carried out by a Research Dept. of I.C.I. in Scotland and showed some promise. Turbulence is necessary for good penetration.

### Diptera

See No. 2038.

### 459. Other Animals

See Nos. 1922, 2010

### 46. Damage by Man

See also Nos. 1578, 1585.

2093. MALCOLM, D. C. *Site degradation in stands of natural Pine in Scotland.* *Bull. For. Dep. Univ. Edinb.* No. 4, 1957. pp. 39. 15 refs. Price 7s.

A study of degraded remnants of natural forest in the Scottish Highlands is described in detail. Where the tree canopy has been more or less completely destroyed, there follows invasion by undesirable plant species, a rapid decline in site quality due to a rise in water-table, and a deterioration in the chemico-physical qualities of the humus layers. Degradation is increased by burning and grazing. Improvement entails drainage and the re-introduction of broadleaved species.

2094. DUCHAUFOUR, P. Note sur l'influence du fauchage de la litière sur l'évolution des sols et de la végétation des forêts du sud-ouest. [The effect of cutting for litter on soil development and ground vegetation in the forests of S.W. France.] *Rev. for. franç.* 9 (10), 1957 (750-60). 4 refs. [F.]

It is a general practice in these rather sparse Oak/Chestnut coppice forests to cut the ground vegetation every 2 years or oftener for use as stable litter or compost. A study showed the practice to favour a vegetation of dwarf gorse, bracken, heaths and *Molinia*, preventing the formation of raw humus and podzolization, but leading to increasing impoverishment in bases and progressive acidification of the upper horizons. Constant removal eventually causes nutrient deficiencies and the gradual invasion of moss.

2095. SMEETS, J. G. P. M. Wettelijke regelingen in enige Europese landen betreffende strooiselwinning. [Statutory regulations relating to litter removal and use in some European countries.] *Ned. Bosb.-Tijdschr.* 29 (11), 1957 (271-3). 2 refs. [Du.]

Belgium, France, England, Germany, Switzerland, Austria, and Scandinavia are covered in more or less detail.

### 48. Injuries Due to Unknown or Complex Causes

See also Nos. 1857-8, 1864, 1922, 1931, 2487.

2096. GRASSO, V. Le formazione a scopazzi su alcune specie di pini. [The formation of witches' brooms on some species of Pine.] *Ital. for. mont.* 12 (4), 1957 (164-6 + 6 photos). 8 refs. [It.it.f.]

Describes some unusually large and dense witches' brooms on *Pinus nigra* and *P. pinaster*. No causal organism has been discovered. Experimental grafts have been made with material from the

affected trees to see if the disorder can be propagated. [Cf. F.A. 11 No. 1508.]

2097. STOATE, T. N., and BEDNALL, B. H. Disorders in conifer forests. *Bull. Wds. For. Dep. S. Aust.* No. 11, 1957. pp. 9. 22 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

A discussion of possible causes, with particular reference to *Pinus pinaster* and *P. radiata* in Australia. [Cf. F.A. 16 No. 3238.]

2098. FOSTER, R. E. Pole blight of Western White Pine. *Timber of Canada* 18 (9), 1957 (60 . . . 66, 100). 9 refs.

Discusses distribution, symptoms, and effects of removing diseased stems, high temperatures and drought and root mortality. Co-operative research programmes are described.

2099. PARKER, A. K. The nature of the association of *Euromium trinacriforme* with pole blight lesions. *Repr. from Canad. J. Bot.* 35, 1957 (845-56 + 2 plates). 16 refs.

*E. trinacriforme* was isolated from 11% of the lesions on *P. monticola* affected with pole blight in the interior of British Columbia, and from 84% of the lesions on Pine on the coast. It was, however, unable to cause the pole-blight condition within a period of 4 years after inoculation of healthy Pine. On the basis of radial-growth analysis it was evident that lesions occur following a general reduction in radial increment and at the same time as, or shortly after, the first crown symptoms of pole blight appear. Radial growth below lesions was nearly always less than in other parts of the stem section, indicating that both the position and extent of lesions are determined before they occur. Studies indicate that *E. trinacriforme* most likely enters and extends lesions formed by other agents.

2100. BUCKLAND, D. C., and KUIJT, J. Unexplained brooming of Douglas Fir and other conifers in British Columbia and Alberta. *For. Sci.* 3 (3), 1957 (236-42). 20 refs.

The witches' brooms on Douglas are described with photographs. The literature of similar non-parasitic brooms in conifers (7 European and 2 American genera) is listed. Among causes discussed, somatic mutation appears the likeliest. Future work should include studies on anatomy, pollination within the broom and from it to normal branches, and cytogenetical work on progeny or meristem.

2101. SCHÖNHAR, S. Braunfleckengrind und Rindentod der Pappel. ['Braunfleckengrind' and the Poplar disease caused by *Dothichiza populea*.] *Allg. Forstzeitschr.* 11 (27/28), 1956 (349-52). 5 refs. [G.g.]

Discusses symptoms and possible causes of the bark necrosis termed 'Braunfleckengrind' which attacks particularly Black Poplars aged 10-25 years, but has also been found on 3-year plants, and to which *Populus × robusta* is especially susceptible. A number of irregular brown patches, 2-10 cm. in

diameter, appear on stem or branches, mostly in March or April. A few weeks later, the necrotic bark buckles and bursts, leaving a wound exuding dark-coloured sap, which dries up after a further few weeks. The necroses have been observed on smooth bark only, and appear to be more frequent around lenticels. They seldom lead to death, but often cause severe degrade of the wood, which

becomes dark-brown below the affected bark. When 40 inoculates of nutrient media were made with diseased tissue, *Dothichiza populea* developed in 29 test-tubes (in 12 together with bacterial cultures, in 17 alone). The remaining 11 test-tubes contained bacteria and fungi of the genera *Mucor*, *Fusarium* and *Cladosporium*. Research into possible connexions between the two diseases continues.

## 5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

2102. PRODAN, M. Bericht über die Tätigkeit des Arbeitskreises für Forstliche Biometrie. [Report on the activities of the Study Group for Forest Biometry.] *Allg. Forstzeitschr.* 11 (25/26), 1956 (335-8). 20 refs. [G.]

Briefly reviews the activities of this informal research group, founded in 1953 primarily to encourage the application of mathematical statistical methods to practical forestry problems. Published and unpublished work of its members is listed under the headings: combined site and yield studies; sample surveys and management; assortments and financial yields; and other papers. [Cf. *F.A.* 18 No. 1958.]

### 52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

#### 521. Diameter (Girth) and Sectional Area

See also Nos. 2113, 2133.

2103. HORN, A. G., and KELLER, R. C. Tree diameter at breast height in relation to stump diameter by species group. *Tech. Note Lake St. For. Exp. Sta.* No. 507, 1957. pp. 2.

Gives a table showing the relationship for stumps of 4-36 in. diam. (o.b.) for softwoods, hardwoods, and Aspen; data are based on stump and d.b.h. measurements in randomly selected stands in Minnesota.

2104. VIMMERSTEDT, J. P. Estimating d.b.h. from stump diameter in Southern Appalachian species. *Res. Note Stheast. For. Exp. Sta.* No. 110, 1957. pp. 2.

Presents a table based on measurements of diameters from 0.6 to 33 in., relating d.b.h. (o.b.) to diameters at 6 in. above ground, o.b. and/or u.b., for 9 species or groups, including various Oaks, Tulip Tree, Yellow (Shortleaf, Pitch and Virginia) Pines, Red Maple, and Black Locust.

2105. MILLER, S. R. Relationship of stump diameter to diameter at breast height for Slash Pine. *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 4, 1957. pp. 2 + 4 gphs. 2 refs.

Measurements were made on 482 standing trees, half on lowland or pond sites (large amount of butt swell) and half on hill sites. Two regression equations were calculated for each of the two general sites, with d.b.h. as the dependent variable. Stump height and stump d.o.b. were the independent variables in one equation for each site and stump

height and stump d.u.b. for the other. Considerable differences were found in the equations for the two sites, but little difference was caused by use of d.o.b. or d.u.b. Graphs were prepared from which d.b.h. can be read for different stump diameters, on the two sites.

2106. HIRATA, T. [Harmonic means in Bitterlich's sampling.] *Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (9-14). 12 refs. [Jap.e.e.]

Actual and Bitterlich-derived diameter frequencies are compared graphically from a concrete case and equations given for the harmonic (*HB*) and arithmetic (*AB*) means of both the b.a. (*g*) and diameter (*d*) distributions of the Bitterlich population. The ratios (tabulated) of these means to the actual population mean,  $\bar{g}$ , show that

$$\bar{g} = gHB < gdHB < gdAB < gAB.$$

As trees/ha. in Bitterlich sampling is estimated from total b.a. of sample over mean b.a. sample, the use of a mean, other than *gHB*, results in a negative bias (values given). Errors in rounding off for stems/diam.-class are also discussed. [Cf. *F.A.* 19 No. 757.]

2107. FINCH, H. D. S. Plotless enumeration with angle gauges. *Forestry* 30 (2), 1957 (173-92). 32 refs.

The basic method and theory for determining basal area with angle gauges are explained. Limitations in use are pointed out, and modifications and developments discussed. An explanation is given of the use of the angle-gauge principle for determining height and volume. Next, the instruments themselves are discussed and finally the *Spiegel-relaskop* and its wide range of uses. For the future, the author considers consolidation of ideas more likely than any very startling new developments. *From author's summary.*

2108. KER, J. W., SMITH, J. H. G., and WALTERS, J. Observations on the accuracy and utility of plotless cruising. *B.C. Lumberm.* 41 (11), 1957 (32...36). 7 refs.

The mean error of 25 untrained students in estimating the b.a. on 8 plots of 0.1 acre with 3-dioptre prisms varied from -37 to +1%; and using their thumbs as relascopes, -44 to +36%. The third author's assessments of b.a. in 8 plots (b.a. 100-350 sq. ft./acre and age 20-400 years) using a slope-correcting mirror relascope and sighting angles corresponding to b.a. factors of



5, 10, 20 and 40 (which multiplied by tree numbers give b.a./acre) are tabulated, along with the % of tree numbers erroneously included and excluded. This last error is mostly compensating, but is significantly greater in older growth. The b.a. factor 20 showed the best cost/accuracy balance. Common 3-dioptre prisms, with mean b.a. factor 9.8 were also used on 39 plots of 0.1 acre of Douglas/Hemlock/Cedar, and b.a. analysed for correlations by species, all species, and crews. The correlations are discussed. Individual cruisers again showed wide variations. In 44 plots of 0.4 acre the correlation of *actual* basal areas with corresponding total volumes was only 0.82, accounting thus for the 10% less of volume variation than Grosenbaugh and Stover [see *F.A.* 18 No. 4382] could explain with the *estimated* b.a. of their study. In local second growth, it is considered that  $\geq 67\%$  of volume variation could be accounted for by expert prism or relascope users, but this % could, of course, be raised by good data for mean heights and diameters. Plotless sampling will probably cost less than conventional sampling, and Howard [see *F.A.* 18 No. 4412] has shown how an advantage of the latter in stand-table construction can be assured by the former. Training and practice, calibration of instruments, check on every cruise by some measurement, correction for slope, and avoidance of brush etc. will ensure correct plotless cruising, which is based on sound theory.

2109. GOULD, E. M., JR. **The Harvard forest prism holder for point-sampling.** *J. For.* 55 (10), 1957 (730-1). 1 ref.

[Cf. *F.A.* 16 No. 4371.] Describes a device for easier handling of prisms in plotless cruising. The prism is cemented into a holder of Plexiglass and mounted on a 5 × 9-in. case by a pivot rod running through the holder. For use on slopes the pivot screw is pressed to release the prism holder, which swings like a pendulum until it has adjusted itself to the degree of slope. The total cost of materials is estimated at \$3.

## 522. Height, Length

See also Nos. 2113, 2141.

2110. ECKERT, K.-H. Die Verwendung halblogarithmischer Zeichenpapiere als Hilfsmittel der Höhenmessung bei der praktischen Forsteinrichtung und der Darstellung von Höhenkurven. [The use of single logarithmic paper as an aid to height measurement in working-plan preparation, and in the presentation of height curves.] *Allg. Forst- u. Jagdztg.* 128 (12), 1957 (257-62). 5 refs. [G.g.e.]

Demonstrates, by reference to height curves and height development curves based on Wiedemann's tables for the main forest species, that for stands > 40-45 years, the relationship between the logarithm of d.b.h. and height can, within a range of ca.  $\pm 10$  cm. round the mean stem b.a., be represented as a straight line with a high degree of accuracy. Thus, if height measurements within this range, which can be easily estimated by any experienced forester, are plotted over diameter on single logarithmic paper, it becomes unnecessary, in order to determine volume, to take special height measurements of trees of the

d.b.h. corresponding to the mean stem b.a. after this has been computed.

## 524. Determination of the Volume of Trees and Stands

### 524.1. Principles of Volume Determination. Form (Taper)

See also No. 2140.

2111. BRYNDUM, H. Formtal for poppel. [Form factors for Poplar.] *Dansk Skovforen. Tidsskr.* 42 (3), 1957 (193-6). [Dan.]

Form factors for total volume and for merchantable volume for different diameters and heights are shown in graphs. Because of the smallness and heterogeneous nature of the material (6 species and hybrids were included) the results can only be indicative.

2112. GOCKERELL, E. C. **Determination of form class of standing trees with an angle gauge.** *J. For.* 55 (9), 1957 (656-9).

Describes the use of the angle gauge or equivalent variant of that instrument, for determining the form class of standing trees from the ground. Theory and practice (which also needs an Abney level) are given in detail, with the tables and graphs involved. The method proved accurate when tested on 20 second-growth Douglas Fir and Western Hemlock ranging from 11.8 to 24 in. d.b.h.

### 524.3. Volume of Tree Groups and Stands

See also No. 2156.

2113. ESSED, F. E. **Estimation of standing timber.** H. Veenman & Zonen, Wageningen. 1957. pp. 60. 35 refs. [E.e.du.]

The efficiency of different new or adapted methods of estimating tree dimensions was tested, and results are discussed. They include: the distance method [see *F.A.* 14 No. 1401] for stem number; computation of the mean volume using Berkhout's formula; measurement of diameter using the caliper and Becking's tree fork (comprising two metal rulers with a fixed angle, and provided with a scale corresponding to the diameter classes of a cylinder caught between them); the cone method [see *F.A.* 18 No. 713] for estimating mean height and (using formulae and tables) volume/ha.; and estimation of increment from increment cores.

2114. LEHMANN, J. Ein einfaches Massenschätzungsverfahren. [A simple method of estimating stand volume.] *Forst u. Jagd* 7 (10; 11), 1957 (465-7; 521-3). [G.g.]

Demonstrates, by reference to yield tables in use in E. Germany, that for some important European hardwoods and conifers, stand volume in 'timber' [ $> 7$  cm. in diam.] can be estimated, either graphically, or by calculation, with remarkable accuracy, assuming a straight-line relationship between mean height and volume, independently of age and site, and gives for a number of species the multiplication factor and the amount to be deducted from mean height to arrive at effective height (i.e. the height reached by a tree when 'timber' begins to be laid

down). All figures are rounded to avoid fractions, and apply to fully stocked stands, but simple rules, using graphs, allowing for stand density and mixtures are also given.

2115. SMITH, J. H. G., and KER, J. W. **Timber volume depends on  $D^2H$ .** *B.C. Lumberm.* 41 (9), 1957 (28, 30). 6 refs.

The values of the constants  $a$  and  $b$  within given limits of d.b.h. ( $D$ ) or of the last term, are tabulated for  $V = a + b \frac{D^2H}{100}$ , where  $V$  is volume and  $H$  is total

height. Species (grouped variously for maturity, d.b.h., and provenance) include Douglas and Balsam Fir, *Thuja plicata* and *Chamaecyparis nootkatensis*, *Tsuga heterophylla*, Sitka and 'interior' Spruce (*Picea* spp.), *Pinus monticola*, *P. ponderosa* and *P. contorta*, *Larix occidentalis*, Alder, Birch, Maple, Cottonwood and Aspen, in British Columbia. Another table shows the standard error in % for very tall and very short trees for each species or group.

2116. CROMER, D. A. N., and CARRON, L. T. **The volume line with reference to *P[inus] radiata*—its derivation without the use of sample trees.** *Leafl. For. Timb. Bur. Aust.* No. 76, 1957. pp. 16. 10 refs.

The linear regression of the volumes of individual trees on their respective basal areas, known commonly as 'the volume line' [cf. *F.A.* 18 No. 3169], shown by experience to hold for small, even-aged, homogeneous stands, and used to obtain volume for the stand or for individual diameter classes, is reviewed. Methods of establishing it conventionally by measuring the volumes of individual standing sample trees are discussed. An investigation was carried out on data of 51 yield plots in a *P. radiata* plantation, Kowen, Australian Capital Territory, for correlations between the statistics of the volume line and appropriate, easily measured indexes of the crop, with a view to determining the volume line of a plot without measuring the volumes of sample trees. Correlations of the regression constant and coefficient of the volume line, with various indexes of the crop, are shown. The regression of  $b$  on top height, and  $a$  on top height and mean basal area, are used to estimate the volume line of a plot with a reliability equal to sample-tree methods. *Authors' summary.*

2117. FINCH, H. D. S. **New ways of using the general tariff tables for conifers.** *For. Rec. For. Comm. Lond.* No. 32, 1957. pp. 11. 4 refs. Price 1s. 3d.

Examines two new ways of applying the general tariff tables [a series of related volume tables based on g.b.h. alone, cf. *F.A.* 17 No. 4276] to standing crops, which will dispense with the need for sample trees from the main crop, whether felled or standing. Part I compares the thinning tariff number and the main-crop tariff number in a stand, from permanent-sample-plot records for 10 species, and establishes a correlation between them. The practical application of 'tariff substitution' is explained. Over all species and thinning grades the thinning tariff

underestimates the main-crop tariff by about one tariff number, and a more precise estimate of volume would be given, therefore, if the mean tariff calculated from the thinnings were raised to the next highest number, and this adjusted tariff applied to the standing crop. Part II examines the relationship between the tariff number and the top height of a stand, and gives a table of tariff numbers for top heights of 30–80 ft. by 1-ft. gradations, for Scots and Corsican Pine, European and Japanese Larch, Norway and Sitka Spruce, and Douglas Fir.

2118. CHOW, C., and YANG, Y.-C. **Tree volume tables for artificial stands of *Cryptomeria japonica* in the experimental forest of National Taiwan University.** *Memoirs of the College of Agriculture, National Taiwan University, Taipei* 4 (3), 1956 (55–64). 3 refs. [E.] C.G.B.

Presents in tables, charts, and regression equations, data on [merchantable?] volume with or without bark (in cu.m.), on the basis of 98 trees from 25 plots. Bark % and mean bark thicknesses at b.h. are also tabulated and the accuracy of the various data discussed.

2119. MARIANI, M. **Tavola di cubatura e tempi di utilizzazione di una piantagione di eucalitto in filare.** [Volume tables and logging time study for a row plantation of Eucalypts.] *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (191–214). 3 refs. [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

524.6. **General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising**

See also Nos. 1718, 2106–9, 2176.

2120. BRAUN, R. **Eine laufende Forstinventur in Österreich. Folgerungen aus dem Vergleich der 3. Schwedischen Reichswalddataxation und der Österreichischen Waldstandsaufnahme.** [A continuous forest survey in Austria. Conclusions from a comparison between the 3rd Swedish and the Austrian forest survey.] *Öst. Vjschr. Forstw.* 98 (2), 1957 (76–104). 16 refs. [G.]

The author, who has had practical experience of the Austrian and the Swedish surveys, describes, for both, the general plan, methods of sampling and/or inventory techniques applied, the data collected, organization, personnel and costs of field work and computation etc. While recognizing that the different conditions and objects in the Austrian survey necessitated and justified the methods adopted, the author stresses their inherent drawbacks. The chief of these are thought to be that: (1) the amount of staff and equipment required was expensive in time and money; (2) most of the data (apart from b.a., for which angle-count sampling was widely used) were estimated from yield tables and tariffs not strictly applicable to the region; (3) the data so obtained for the unmanaged forests (ca.  $\frac{1}{3}$  of the whole area) were combined with working-plan data from the managed forests, though not strictly comparable; (4) no increment borings were taken, and no distribution of volume or increment over diameter classes was worked out;



(5) though the size and condition of unstocked areas requiring reforestation is given, no stump inventories were made and no information on fellings is available; (6) statistical precision is lacking; (7) the data will soon be obsolescent and cannot be kept up to date, periodic repetition being out of the question.

The author then outlines his proposals for a continuous sampling survey on the Swedish model, with the necessary adaptations of sampling intensity etc., for which stratification into 3 main altitudinal and yield zones is suggested. [Cf. *F.A.* 17 No. 1837; 18 No. 3171.]

2121. MATH[A]JUDA, G. S. *Methods of forest surveys in India*. Forest Research Institute, Dehra Dun. 1957. pp. 6. 21 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2122. LOETSCH, F. *A forest inventory in Thailand*. *Unasylva* 11 (4), 1957 (174-80).

[Cf. *F.A.* 19 No. 772.] Describes a method developed for an inventory of the northern Teak-bearing provinces of Thailand, where Teak is scattered among other species of mixed deciduous forest of low stocking. Sampling was based on stratification worked out from aerial photos: (1) below 1000 m. (a) mixed deciduous, (b) semi-evergreen, (c) dry Dipterocarp type, (d) non-forested, (2) above 1000 m. inaccessible forest of protective value. Field-sampling and computation methods are described, and costs estimated.

2123. EICHEL, G. H. *Methoden der Wald-inventur in Britisch-Columbien*. [Forest inventory methods in British Columbia.] *Allg. Forst- u. Jagdztg.* 128 (8/9), 1957 (185-8). 5 refs. [G.e.]

Describes the system of strip cruising for volume estimates and 'exploded' plot-sampling for general inventory. In the latter, instead of 1 plot at the grid intersection, 4 smaller plots 40 m. from it (2 on the compass line and 2 at right angles to it) are used. Describes also the data collected, the degrees of survey intensity from aerial reconnaissance to 10% enumeration, the use of aerial photographs, field work and staffing (mostly students on vacation) etc., with a short note on the maps and volume tables produced.

2124. OGDEN, W. H. *Some statistical aspects of county forest inventorying in the Tennessee Valley*. *J. For.* 55 (9), 1957 (664-5).

Tables show the mean gross merchantable volume of sawtimber and the sample coefficients of variation for 25 counties, based on data from 3754 sample plot measurements. Sampling errors ranged from 12.5 to 7.5%, and the size of sample (150 plots of 0.2 acres for each county) was considered satisfactory. The sample variance is tabulated for 10 counties from (a) random sampling based on geographic strata, and (b) simple random sampling. In most cases there was a slight loss in precision from (b), but systematic geographical stratification is convenient as well as being slightly more accurate.

2125. PENFOUND, W. T., and RICE, E. L. *An evaluation of the arms-length rectangle method in*

*forest sampling*. *Ecology* 38 (4), 1957 (660-1). 3 refs.

An evaluation was made of the efficiency of a method of sampling devised by the authors [cf. *F.A.* 16 No. 4386], in which one of a pair of samplers paces along a transect line with outstretched arms, to cover an imaginary rectangle of 0.01 acre while his companion records data on species, diameters etc. occurring within it. The standard of comparison was a complete census of a forest consisting mainly of *Fraxinus pennsylvanica*, with 60 arms-length transect rectangles, on the basis of relative frequency, relative density, relative b.a. and importance % of species. Values obtained by the two methods were very similar.

2126. STRAND, L. *Virkningen av flatestørrelsen på nøyaktigheten ved prøveflatetakster*. [The effect of plot size on the accuracy of sample-plot surveys.] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (620-33). 9 refs. [Nor.nor.e.]

The coefficient of variation (c.v.) of the basal area or volume is approximately inversely proportional to the square root of the plot size for plots within a limited area (e.g. 2 dekares). The variation between plots within a stand does not appear to increase much with increasing stand area. Errors will also depend on the variation between stands. This is not much influenced by plot size, and the greater the variation between stands the less will errors be diminished by increasing plot size. For plots of 100 sq. m. the variation will be fairly wide even in small areas (2 dekares). In one example the c.v. of volume in felling classes II-III [see *F.A.* 13 No. 2358] was about 30% and in class Vb 80-90%. Taking costs into consideration it seems improbable that the most efficient plot size in Norway will much exceed 100 sq. m. *From author's summary.*

## 525. Volume by Assortments. Merchantable Volume

See also Nos. 1944, 2156.

2127. JOHNSON, F. A. *A technique for calculating cubic volumes in butt logs of trees*. *J. For.* 55 (9), 1957 (666). 4 refs.

A graphical approach using a paraboloid formula and claimed to be accurate, very fast (provided that a calculating machine is available), and applicable to an entire tree or a portion of it.

## 526. Log Measurement. Scaling

See Nos. 2373, 2490-1.

## 527. Solid Volume of Stacked Products (including Converting Factors)

2128. BICKFORD, C. A. *Converting factors for stacked wood*. (Revised.) *For. Res. Note Ntheast. For. Exp. Sta.* No. 72 (rev.) 1957. pp. 3.

[Cf. *F.A.* 18 No. 4417.] The note has been revised because the factor used for converting barked round cords into unbarked round cords was found to be too small.

2129. MAKONEN, O. *Aisattujen 2m koivu-paperipuiden kuorettoman kiintokuutiomäärän ja*

pinokuutiomäärän suhde Keski-Suomesta hankitun aineiston perusteella. [The ratio between the solid cubic volume, excluding bark, and stacked cubic volume of 2-metre Birch pulpwood barked in strips, from material collected from central Finland.] *Tied., Metsäteho, Helsinki* No. 132, 1957 pp. 8. 2 refs. [F.i.e.e.]

About 58% of the stacked volume (6 stacks totalling 3500 bolts) of the pulpwood barked in strips was solid timber.

2130. BASSETT, K. H., and YOUNG, H. E. **Pulpwood pile volume determination by use of the dot grid.** *Tech. Note Univ. Me. For. Dep.* No. 47, 1957. pp. 3.

Describes the use of a dot grid on a contoured map of a pile of pulpwood, to take the place of planimetry [cf. *F.A.* 18 No. 4418], for determining (a) mean height, (b) basal area, and (c) volume, of the pile. The results of a limited study indicate that use of the dot grid effects a considerable saving of time, and gives sufficiently accurate results, for large symmetrical piles, located on flat ground and drawn on a large scale.

### 53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 1572, 2113, 2140.

2131. LEMMON, P. E. **A new instrument [the spherical densiometer] for measuring forest over-story density.** *J. For.* 55 (9), 1957 (667-9). 1 ref. [Cf. *F.A.* 18 No. 3184.]

2132. KRAJICEK, J. E., and BRINKMAN, K. A. **Crown development: an index of stand density.** *Sta. Note Cent. St. For. Exp. Sta.* No. 108, 1957. pp. 2.

A study of crown characteristics of several hundred open-grown Oak, Hickory and Norway Spruce in Iowa showed a high correlation between stem diameter and crown area. This relationship can be used to determine the crown competition factor (CCF). The CCF of a stand of open-grown trees distributed over an acre of land so that the crowns meet but do not overlap is taken as 100, representing the sum of the %s of an acre occupied by the crowns of individual trees: a similar stand containing twice as many trees would have a CCF of 200. In practice, measurements are made of a number of open-grown trees to obtain the relationship between d.b.h. class and % open-grown crown acreage per tree. In a given stand, this acreage % can be multiplied by the number of trees in a diameter class, to obtain the total crown acreage % for the class. The sum of these % values is the stand CCF. In heavily stocked, even-aged Oak stands in Iowa a very constant CCF value was obtained regardless of site or age, and a similar result was obtained from yield tables of even-aged upland Oak. In theory, the CCF should apply equally well to uneven-aged stands, but this has not yet been tested. The method will be described in more detail elsewhere.

2133. NAKAMOTO, M. [The relation of number of trees and their average diameter in pure, full stocked and even-aged stands.] *J. Jap. For. Soc.* 38 (4), 1956 (130-5). 5 refs. [Jap.jap.e.e.]

Presents equations for calculating the correlations:  $C = (A/N)^{\frac{1}{2}}$  when  $C$  is the average distance between trees,  $A$  the area of the stand and  $N$  the number of trees;  $C = a + bD$  where  $a$  and  $b$  are constants and  $D$  is average d.b.h.; and

$$N = \frac{A}{(a + bD)^2}$$

in which  $A$  is unity for unit area. The equations were tested on sample plots of *Pinus densiflora*, *Cryptomeria japonica*, *Chamaecyparis obtusa* and *Larix leptolepis*, and gave results generally agreeing well with measured data. *From author's summary.*

### 54. Assessment of Site Quality

See also Nos. 1474, 2139, 2147, 2163, 2565.

2134. WECK, J. **Neuere Versuche zum Problem der Korrelation: Klima und forstliches Produktionspotential.** [Further attempts at correlating climate and Ideal Site Class.] *Forstarchiv* 28 (10), 1957 (223-7). 20 refs. [G.]

Examines critically the concept of an index showing the intimate connexion between climate, vegetation, and productivity (CVP index), proposed by Paterson [see *F.A.* 18 No. 1176]. The author considers the limitations of the CVP index as a measure of Ideal Site Class and suggests some emendations.

2135. COBB, F. W. **A test of the application of existing site-index curves to the flatwoods Slash Pine type [of N.E. Florida and S.E. Georgia].** *Res. Note Stheast. For. Exp. Sta.* No. 111, 1957. pp. 2. 2 refs.

An analysis similar to that employed by Coile and Schumacher [see *F.A.* 15 No. 1652], but substituting the site index of older trees for that of soil-site values, resulted in curves lying slightly above those in *Misc. Publ. U.S. Dep. Agric.* No. 50 for the early years of a stand, so that height at 10-30 years is slightly greater for a given height at 50 years.

2136. PROCHMAN, A. E. **Vegetation site type—soil studies in the Spruce-Alpine Fir forest type, central interior of British Columbia.** *Abstr. in Agricultural Institute Review, Ottawa* 12 (3), 1957 (44). 1 ref.

In detailed surveys of ground vegetation and soil profiles, supplemented by some soil analyses, 6 vegetation site types, each carrying a characteristic forest stand (species, density, site index etc.) were distinguished and related to representative soil profiles and topographic conditions. Soil moisture appeared to be the most important single differentiating factor within a climatic region.

2137. DAGNELIE, P. **Recherche sur la productivité des hêtraies d'Ardenne en relation avec les types phytosociologiques et les facteurs écologiques. Troisième partie. Interprétation des résultats.** [The productive capacity of Beech forests in the Ardennes related to types of plant association and ecological factors. Part III. Interpretation of results.] *Bull. Inst. agron. Gembloux* 25 (1/2), 1957 (44-94). 11 refs. [F.f.] E.M.B.

[Cf. *F.A.* 18 No. 4429.] In the third part of this study a statistical analysis and an interpretation of



results of measurements obtained on 80 different sites are related to ecological, phytosociological and silvicultural data. Data are also presented on the productivity and some characteristics of the stands. The following conclusions are drawn from the work as a whole. In the Ardennes Beech forests, a study of the flora can be substituted (though with a certain loss of precision) for height measurements as a criterion of site quality. Pedological factors are the most important of those studied in determining the distribution of different phytosociological types and their productivity. The main pedological factors to be taken into account are: richness in minerals, quality of the organic matter, and moisture. Three main types of stand occur in the Ardennes: (1) Reasonably productive stands where natural regeneration seems possible, i.e. *Festuca sylvatica* and moist *Luzula nemorosa* types, in which c.a.i. of large timber is 5-6 cu.m./ha.; such stands may maintain themselves, but the gradual introduction of more productive species should be considered. (2) Unproductive stands where natural regeneration appears possible, i.e. dry *L. nemorosa* types and some *Vaccinium myrtillus* types with c.a.i. of large timber 4 cu.m./ha. or less; here more productive species must be introduced in greater numbers and more rapidly than in (1). (3) Unproductive stands where natural regeneration seems impossible, i.e. *V. myrtillus* stands in general; here artificial regeneration of a productive and permanent forest is necessary, using the old stand at most as nurse trees.

2138. BHATNAGAR, H. P. Mineral constituents of foliage of Sal (*Shorea robusta*), of different quality classes. *Indian For.* 83 (11), 1957 (647-50). 12 refs.

A total of 80 samples of foliage from mature trees of 4 quality classes (top height at 80 years > 115, 95-85, 85-75, and < 65 ft.) was analysed. Class I trees showed lowest mineral contents in all cases, and Class IV the highest amounts of N, P and K. Class III had highest Ca and Mg, though these were almost as high in IV.

#### 56. Increment. Development and Structure of Stands

See also Nos. 1450, 1458, 1537, 1569-72, 1595 *et seq.*, 1695-7, 1735 *et seq.*, 2173, 2565.

2139. ERTEL, W. Einiges über die ertragskundliche Forschungsmethodik der Gegenwart. [Observations on present research methods in yield studies.] *Arch. Forstw.* 6 (5/6), 1957 (421-31). [G.g.russ.e.]

Illustrates the inadmissibility (for want of comparability) of certain yield-table statistics, e.g. for quality-class appraisal and in thinning research, and discusses the distortions due to the use of arithmetic means. More exact methods are required, e.g. Hummel's analysis of 10 stems drawn from the 100-300 tallest stems for a statistically admissible comparison of growth in stands.

2140. HAMPEL, R. Forstliche Ertragsselemente. [Elements of forest yield computations.] *Mitt.*

*forstl. VersAnst., Mariabrunn* No. 51, 1955. pp. 187. 65 refs. [G.g.]

Partly a restatement of the author's growth-law hypothesis [cf. *F.A.* 14 No. 2530], partly a combination of this hypothesis with existing or modified theories of stem form based on mechanics, with particular reference to crown form and its effect on the portion of the stem within the crown. Good correspondences are found between calculations according to the formulae developed and Guttenberg's stem analyses for Spruce.

2141. TODOROVIĆ, D., and PANTIĆ, S. O nekim poznatim funkcijama rasteinja i o funkciji koja pretstavlja njihov uopšteni oblik. [On some well-known growth functions and a function representing them in a generalized form.] *Šumarstvo* 10 (5/6), 1957 (323-33). 14 refs. [Serb.russ.g.]

A mathematical consideration of the mathematical growth functions of Prodan, Levaković, and Mihajlov (used in smoothing height curves) from which the authors derive a generalized equation, of which the equations examined are special cases. The general equation is tested with satisfactory results on height/diam. data from Šurić's volume tables for Beech.

2142. GRANO, C. X. Growth of Loblolly Pine seed trees in relation to crown density. *J. For.* 55 (11), 1957 (852).

In S. Arkansas a statistical analysis of 55 *P. taeda* of 8-14 in. diam., retained 7 years previously as seed-trees, showed a highly significant correlation between diam. growth and density of individual crowns. Trees with dense crowns showed an annual diam. increment of 0.64 in.; trees with sparse crowns, 0.50 in.

2143. ASSMANN, E. Standraumregelung und Ertragsleistung. [Yield and the regulation of growing space.] *Forstarchiv* 28 (11), 1957 (217-23). 8 refs. [G.]

Discusses, with reference to German literature, the effect of stand structure on volume increment, considering such factors as: assimilation processes, crown relations, the presence of one or more storeys, the interrelations of light-demanding and shade-tolerant species, and the effect of silvicultural measures on volume and quality increment.

2144. ASSMANN, E. Standraumökonomie. [The optimum utilization of growing space.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (158-75). [G.]

A discussion of the ratio of tree increment to crown projection in sq. m., i.e. of the relations between growing space and increment. On the basis of an analysis of figures published by Burger [cf. *F.A.* 15 No. 3362], it is concluded that even-aged stands, reaching an optimum ratio at heights of 12 to 20 m., are in this respect superior to selection forests, where the optimum is not reached until 30 m. or more. In an [unpublished?] investigation by R. Mayer of two Oak trial plots aged 50 and 105 years respectively, it was found that, though absolute increment within each crown class was greatest for trees with the greatest projections, and relative increment per unit of projection was greater for trees

in the higher crown classes than for those in the lower, yet if volume increment was related to sq. m. of crown projection, then, within each tree class, the trees with the smaller projections had higher relative increments, i.e. a better utilization of growing space, than those with larger projections. This high relative increment of narrow-crowned trees is attributed partly to a favourable ratio of total crown surface to crown projection, and partly to physiological age, which in the trees with wide crowns has frequently passed the age of maximum assimilation. The effects of overtopping were studied, using figures derived from a thesis by K. Mang [see next abstract] comparing yields of young mixed stands of Pine, Spruce and Silver Fir (*a*) with or (*b*) without an older residual Pine overstorey, on good sites near Lindau. As the main stand in (*a*) aged, its increment progressively declined compared with (*b*) until at age 55 the difference was about equal to the increment of the overstorey in (*a*), and at age 88, when the crowns of the understorey had grown into the overstorey canopy, there was a difference of 14% in total increment in favour of (*b*).

2145. MANG, K. Der Föhren-Überhaltbetrieb im FA Lindau. [High forest with Pine standards in Lindau forest district.] *Allg. Forstzeitschr.* 11 (37/38), 1956 (473-5). [G.]

A comparison of volume and financial yield of mixed stands, chiefly Silver Fir, Spruce and Pine, in that order, (*a*) with, (*b*) without standards, when managed on a rotation of 90-100 years for the main crop and 180 for the standards. It is based on stem analyses of the standards, sample plots and recorded data of actual and prescribed cuts. After the age of 50, height growth of the main storey near the standards became somewhat depressed, particularly for Pine, which disappeared from the area immediately below them (ca. 6 m. in diameter) but at 6 m. distance, height growth was normal. Total reduction of volume in a circle of 10 m. radius round each standard was ca. 10%. Assuming the optimum stocking of 45 standards/ha., their yield at 150 years, after deducting the volume accrued in the first 90 years of their life, was 155 cu.m./ha., i.e. more than twice the amount of the difference between the (*a*) and (*b*) main crop at 90. In financial terms, the superiority of (*a*) was even greater. Silvicultural methods for obtaining a suitably mixed main stand, with well formed Pines suitable for holding over, are discussed.

2146. MITSCHERLICH, G. Ertragskundliche Fragen der Kiefernwirtschaft. [Yield questions in the management of Pine.] *Forst- u. Holzw.* 13 (1), 1958 (2-8). [G.]

Compares growth patterns and increment of trial plots in the Palatinate with those in Baden [cf. *F.A.* 18 No. 1978] and with Wiedemann's tables. In general, b.a. and volume increment are superior, site quality for site quality, in the Palatinate. Height development corresponds well with the tables. Basal areas are generally greater. Moderate thinnings and long rotations are thought to produce the highest financial yields.

2147. MITSCHERLICH, G. Das Wachstum der Fichte in Baden. I. Das Höhenwachstum und die Bonitätsveränderung. II. Grundfläche, Stammzahl, Durchmesser und Massenzuwachs. III. Über den Aufbau reiner, gleichaltiger Fichtenbestände. [The growth of Spruce in Baden. I. Height growth and shifts in site class. II. Basal area, density, diameter and volume increment. III. The structure of pure even-aged Spruce stands.] *Allg. Forst- u. Jagdztg.* 128 (8/9; 10/11; 12), 1957 (171-84; 219-32; 245-56). 26 refs. [G.e.e.]

[Cf. *F.A.* 18 No. 4433.] A study based on data from 309 temporary and 83 permanent sample plots. Climate appeared to affect site class more than did soil. Site class was lowest in the high parts of the Schwarzwald, where Spruce is natural. In general, height growth and c.a.i. were greater in youth and less after age 40 than in Zimmerle's yield tables; b.a. and volume increments increased with stand density for stands aged > 50 years, but in most areas decreased with increasing density in younger stands. A study of crown development and structure was made in some even-aged stands, analysing the relationship between multi-storeyed structure (expressed by coefficients of variation for stand height and for height, length, diameter and excentricity of crown) and site conditions, wood quality, and volume and b.a. increment. It was found that a storeyed structure could not be maintained in even-aged stands on good sites, and even on the poorer sites, e.g. pseudogleys, the number of live branches near the ground was not great, and their effect on stand climate and soil probably small. No clear correlation between stand structure and % of late wood or increment emerged. Apart from giving protection against snow and wind damage, a storeyed structure did not appear to have any advantages.

2148. YOUNG, H. E. Coniferous plantation growth in central and southern Maine: a preliminary report. *Tech. Note Univ. Me. For. Dep.* No. 46, 1957. pp. 3.

Gives tabulated data for two plantations, by species (*Pinus strobus*, *P. resinosa*, *Picea glauca*, *Larix decidua*): age ( $\leq 36$  years), mean d.b.h., mean height, height m.a.i., mean ploughed depth of soil, mean depth of B horizon, topo-position and drainage.

2149. HARRISON-SMITH, J. L. Forest management of the Whakatane cardboard industry. *N.Z. Timb. J.* 3 (11), 1957 (35-7).

A conference paper on the 15,000-acre Matahina forest, planted chiefly to *Pinus radiata*, 1933-35, which feeds a cardboard mill, sawmill and semichemical pulping plant. Yields from clear fellings from 1947-48 (14-year stands) to 1955-56 (23-year) averaged from 3290 to 5030 cu. ft./acre. *Sirex*-thinned stands indicate a possible m.a.i. of 350-400 cu. ft. Up to the suppression stage an annual growth of ca. 4 ft. in height and 2 in. or more in diameter is attained. Site factors, spacing, height and diameter growth, and extraction are also covered briefly, with suggestions on silviculture.



2150. FOSTER, R. W. A study of the growth and value of a high-quality Eastern White Pine tree. *J. For.* 55 (10), 1957 (727-30). 6 refs.

Analyses the growth of a 125-year tree of *Pinus strobus*, windthrown in 1950 at Warrensburg, N.Y., with d.b.h. 30 in., height 110 ft., and volume 1513 bd. ft. It is estimated that the value of the tree might have been \$100 more, had it been pruned at the right time to a height of 45 ft., thereby reducing loss caused by red rot.

2151. TUSKÓ, F. Adatok az akácművelés elvi kérdéseihez. [Principal questions in Robinia culture.] *Erdőmérn. Földm. Közl.* 1956 (2), (21-52). 63 refs. [Hu.hu.russ.g.]

Hungary, with 200,000 ha. (17% of the forest), has a greater area under Robinia than all the rest of Europe. Its growth rate is compared with that of other species and the data (1933-51) from 47 plots (6 regions) tabulated and height/age index curves drawn for 6 site qualities. Some soil deterioration associated with poor growth is referred to trace-element deficiencies. The floristic differences of good, medium and poor sites on the Hungarian plain are presented in association tables.

#### 561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 2110, 2113.

2152. SEIP, H. K. Målefeil med bestemmelse av radietiltveksten. [Errors in measuring radial increment.] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (557-69). 4 refs. [Nor.e.]

Field measurements of increment cores of Pine and Spruce were compared with more accurate remeasurements in the laboratory. The mean difference ( $d$ ) between the two was positive and generally significant. The regression coefficient was negative and was significant for the whole Spruce material but not for the Spruce when the more extreme differences ( $d > \pm 3$  times the standard deviation) were excluded, or for the Pine material. There was a tendency to underestimate the larger and overestimate the smaller ring breadths.

2153. OSTERMANN, W. Sichtbarmachung der Jahrringe an Buchen-Bohrspänen. [Bringing out the annual rings on Beech increment cores.] *Holz-Zbl.* 83 (120), 1957 (1459). [G.]

After immersion of carefully smoothed increment cores in a solution of 6 parts  $\text{HNO}_3$  + 4 parts water, their annual rings can be counted with the naked eye. For very dark heartwood, polishing and the use of a magnifier may be necessary.

2154. SLÅSTAD, T. Årringundersøkelser i Gudbrandsdalen. [Tree-ring analyses in Gudbrandsdal.] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (571-620). [Nor.nor.e.]

Conclusions are based on 23,428 annual-ring measurements in living trees of Spruce or Pine and 4322 in building timber. Ordning's standard scale for E. Norway [see *F.A.* 5 p. 144] could not be used for dating the Gudbrandsdal curve. Even within Gudbrandsdal the correlation between curves for

different groups of material was poor. The material from mountain forests showed a significant relation between annual-ring width and the temperature of the summer of growth. The material from drier localities showed a relation of annual-ring width with rainfall during both summer and winter. These variations made dating of the older building timber difficult.

2155. MOTT, D. G., NAIRN, L. D., and COOK, J. A. Radial growth in forest trees and effects of insect defoliation. *For. Sci.* 3 (3), 1957 (286-304). 15 refs.

Confirms that morphogenesis in (a) *Abies balsamea*, (b) *Larix laricina* and (c) *Pinus contorta*, respectively from eastern, central and western Canada, is similar to that of *Pinus resinosa* [cf. *F.A.* 15 No. 81] and compares, with many graphs, the relative values of three types of ring-width sequence [referred to in that abstract] for the study of normal growth, and particularly the effect on normal growth in (a) (b) and (c) of defoliation by *Choristoneura fumiferana*, *Pristiphora erichsonii*, and *Recurvaria starki*, respectively. (1) The oblique sequence (width of ring of a single year followed in each internode) has special advantage in studying the effect of defoliation on radial growth in conifers especially where top injury is more severe. (2) The conventional horizontal sequence (ring-widths along radii) coincides in the lower bole with minimum growth, or, if taken higher in the crown, is confused with growth pattern. (3) The vertical sequence (of rings separated from the pith by the same number of rings at each internode) eliminates growth pattern, as all rings are laid down by equal-aged cambia; those vertical sequences of the 1-, 2-, and 3-year type provide the longest series, and are most sensitive to environmental conditions, and contain rings of maximum width. Sequences (1) and (2) are both desirable in studying the effect of injury over a period and in detecting the first year of its effect. The evidence of each type of sequence is referred to the known history of defoliation, flowering, etc. and notes are given of the number of internodes requiring to be sampled for the drawing of curves.

#### 565. Sample-Plot Technique

2156. ABADIE, J. Méthode de calcul du volume des populations sur pied dans les places d'essais de sylviculture. [Methods of calculating volume of growing stock on forest sample plots.] *Ann. Éc. Eaux For. Nancy* 15 (1), 1956 (1-135 + 1 gph., 24 tbls.). 20 refs. [F.e.g.]

The author works out mathematical and statistical techniques for use in connexion with P. Ayral's method of calculating total volume and volume by assortments, of stands remaining after thinnings [see *F.A.* 15 No. 3922]. Ayral contributes an introduction explaining his system of stratified sampling of various tree classes, based on g.b.h., dominance (1, 2, 3), crown class (A, B, C) etc. The studies are on the following subjects: (1) method of least squares; (2) normal volume distribution for each g.b.h. class in a given tree class on a given

site; (3) comparison of classes (e.g. 1A and 2A); (4) comparison of thinnings with residual stand; (5) methods of volume estimation based on tree classes; (6) comparison of different methods of volume estimation; (7) verification of the formula for determining standard error; (8) calculation of assortments for tree classes.

#### 566. Yield Tables and Their Construction

See also No. 2191.

2157. MAGIN, R. Probleme bei der Aufstellung von Leistungstafeln für mehrschichtige Mischbestände. [Problems in the construction of yield tables for multistoreyed mixed stands.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (176-85). [G.]

On the basis of his investigations into natural mixed forest of Spruce, Silver Fir, and Beech in the Bavarian Alps [cf. *F.A.* 16 No. 781] the author discusses the question of reliable yield-class criteria for mixed stands, and the effect of site, species composition, and stage of development on increment. The stands in question have 3 storeys clearly representing 3 generations. Expressed in weight of dry woody matter, a fairly close correspondence was found between the share of each species in stand volume and increment, the increment of Spruce being slightly above, that of Silver Fir slightly below, and that of Beech equal to, their relative proportions by volume. A yield graph is presented and an example worked out. Application of a similar method for determining the yield of selection forest, distinguishing between site types and, within each site type, between forms of structure (e.g. rich in small, medium or large trees) is considered possible.

2158. STONE, E. L. British yield tables for European and Japanese Larches in New York. *Agronomy Paper, Cornell University, Ithaca, N.Y.* No. 397, 1957. pp. 4. 4 refs.

European and Japanese Larches are being widely used for farm forest planting in New York. Since detailed yield tables cannot yet be constructed from American data, British Forestry Commission tables have been adapted for use in N.Y. by converting Hoppus measure to standard units.

2159. PARDE, J. Douglas et tables de production. [*Pseudotsuga taxifolia* and yield tables.] *Ann. Éc. Eaux For. Nancy* 15 (1), 1956 (137-68 + 1 map, 6 gphs.). 29 refs. [F.e.g.]

Discusses the adaptation of the British Forestry Commission's yield tables [cf. *F.A.* 15 No. 2758] to Douglas Fir grown in France.

2160. EVANS, W. R., and CHRISTIE, J. M. Provisional yield table for Western Hemlock [*Tsuga heterophylla*] in Great Britain. *For. Rec. For. Comm. Lond.* No. 33, 1957 pp. 20. 17 refs. Price 1s. 9d.

Based on 32 plots (only two of them > 50 years old) covering, as far as possible, the range of conditions under which the species is grown in Britain. The table indicates that Western Hemlock grown as a pure crop will, in Great Britain, produce yields only slightly less than Douglas Fir or Sitka

Spruce, and that there are few areas in Great Britain that will not produce a satisfactory crop.

2161. CANTIANI, M. Tavola alsometrica delle fustaie coetanee di faggio dell' Irpinia. [Yield table for the even-aged Beech stands of Irpinia.] *Ital. for. mont.* 12 (5), 1957 (226-39). [It.it.f.]

Tables have been constructed from which may be read, for different ages, number of trees/ha., mean height, b.a. and diameter, volume by assortments before and after thinning, and rates of increment (c.a.i., m.a.i., and increment %), all for 3 site classes.

2162. CONSANI, W. Tavola alsometrica della faggeta del Cansiglio. [Yield table for Beech in the forests of Cansiglio.] *Monti e Boschi* 8 (9), 1957 (415-20). [It.f.e.]

Local tables, for even-aged Beech stands. The data given, for 3 site classes, are age, mean height, growing-stock volume, c.a.i., m.a.i., and timber and fuelwood assortments.

#### 568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See Nos. 1574, 2144, 2147.

#### 569. Increment; Development and Structure of Stands: Miscellaneous

2163. OVINGTON, J. D. Dry matter production of *Pinus sylvestris* L. *Ann. Bot.* 21 (82), 1957 (287-314). 26 refs.

In 9 plantations and 2 stands of natural regeneration of *Pinus sylvestris* and one plantation of *Pinus nigra* at Thetford Chase, detailed measurements of the tree boles and crowns have been made and average trees selected for dry-weight studies. The oven-dry weights of cones, branches, leaves, boles, and root systems of the sample trees have been determined. At 55 years of age the average tree of *Pinus sylvestris* weighs almost 200 kg. and carries just under  $8 \times 10^5$  needles with a surface area of nearly 100 sq. m. The relative proportions of dry matter contained in the crown, bole, and root system vary considerably and, with greater age of the trees, the bole represents an increasing proportion of the tree weight. The total weight of dry matter produced by a sample tree within its lifetime has been calculated; it is much greater than the standing weight. The largest proportion of the total dry matter produced is contained in the crown and the least in the root system. Except for the oldest plantation of *Pinus sylvestris*, the weight of dry matter contained in the bole and root system of the stock increases with age but the total weights of the leaves and living branches tend to remain more or less constant after an initial build-up period. The total dry weights of boles, leaves, branches, roots, and cones produced by the plantations increase with age, and by 55 years of age the trees have produced almost  $7 \times 10^6$  kg. of dry matter per ha. Current and mean increments of dry matter have been determined for the different components of the plantations; the maximum mean increment of dry matter by the plantations is



attained by about the forty-third year after planting. In the young close plantations 1 kg. dry weight of needles annually produces 0.6-1.9 kg. of dry matter, but in the thinned plantations, after 20 years of age, leaf efficiency increases and the comparable annual production is 1.2-4.4. Comparisons are made between plantations and natural regeneration of *Pinus sylvestris*. The dry weights of trees and plantations of *Pinus sylvestris* and *Pinus nigra* of identical age are compared; in general, Corsican Pine is more productive than Scots Pine. Attention is drawn to the relatively high productivity of *P. sylvestris* in the locality compared with agricultural crops. *From author's summary.*

## 58. Surveying and Mapping. Aerial Surveys

See also Nos. 2029, 2122-3.

2164. WADLEY, T. L. The tellurometer system of [microwave] distance measurement. *Empire Survey Review, London* 14 (105; 106), 1957 (100-11; 146-60 + 1 photo, 1 dgm.) 4 refs. X.

[Cf. F.A. 18 p. 585.] Describes the instrument, its use and field tests, and discusses applications and usefulness. Though developed primarily for geodetic purposes, its lightness and simplicity are such that it may well be useful in applications such as controlling the scale of aerial photography, or for mapping purposes in general, e.g. where it is difficult or unnecessary to carry through a chain of triangulation.

2165. FRANCIS, D. A. The use of aerial survey methods in Scandinavian forestry. *Emp. For. Rev.* 36 (3), 1957 (266-76). 14 refs.

Notes on photography, photo-interpretation (including aids), field work, mapping, and visual surveys.

2166. BOON, D. A. Recent developments in photo-interpretation of tropical forests. *Photogrammetria, Amsterdam* 12 (1), 1955/56 (382-6). 4 refs. [E.] L.S.

A review of some literature, dealing particularly with the possibility of identifying species or groups of species and vegetation types on aerial photographs in tropical forests. On the whole, such identification is more practicable for extreme climatic conditions than for the more favourable climatic conditions of tropical rain forest.

2167. NYSSÖNEN, A. On the estimation of the growing stock from aerial photographs. *Commun. Inst. for. Fenn.* 46 (1), 1955 (1957). pp. 57. 54 refs. [E.f.]

An investigation was made in 118 stands of pure, more or less even-aged, Scots Pine on good sites in southern Finland. A detailed account is given of the sample-plot methods used on the ground (a) and of the methods of interpreting aerial photographs (b) (stereoscopic strips with overlap, scale 1 : 10,000). Comparisons of results showed a Standard Error for volume estimation of  $\pm 30\%$  for (b) and  $\pm 10\%$  for (a); S.E. for mean diameter estimated by (b) was  $\pm 15\%$ . In many cases measurements from aerial

photographs involve the risk of a considerable systematic error; such measurements should therefore be measurements of differences and ratios rather than of absolute quantities, the latter being determined by ground control. The same relativity occurs in other types of interpretation, e.g. in distinguishing tree species on the basis of tonal differences. It is concluded that photographic interpretation, on account of its speed (e.g. heights of 15-20 trees can be determined in half an hour by parallax measurement, and crown closure of 5-6 stands in an hour by dot-grid) is very useful for planning work and making rough classifications, approximate assessments of stand volume etc., and should be used in parallel with ground survey.

2168. WILLINGHAM, J. W. Estimation of forest management inventory data from aerial photographic measurements. *For. Sci.* 3 (3), 1957 (270-4). 14 refs.

Equations, obtained by multiple regression and claimed to be first of their kind, are presented to express  $Y_1$ , radial growth in in. at b.h. during the last 5 years;  $Y_2$ , age at b.h.;  $Y_3$ , d.b.h. in in.; and  $Y_4$ , merchantable volume in cu. ft. (none of which can be read directly from photographs) in terms of  $X_1$ , tree height in ft.;  $X_2$ , crown diameter in ft.;  $X_3$ , crown density %; and  $X_4$ , trees per plot (all of which can be read from photographs). Four equations are given (significant at 1% level) for  $Y_1$  and  $Y_2$  in terms of  $X_1$  and  $X_2$ , and for  $Y_3$  in terms of  $X_1$ ,  $X_2$  and  $X_4$ . The fourth equation (for merchantable volume) is

$$Y_4 = -114.0 + 1.111X_3 + 3.030X_1 + 2.375X_4.$$

Assuming no bias in the residual variance, this equation allows of an actual volume estimate to an accuracy of 9.6 cu. ft. from 29 photo plots with a fiducial probability of 95%. Accuracy of reading required is stated as  $X_1$ ,  $X_2$  and  $X_3$  to 10 ft., 3 ft. and 10% respectively and  $X_4$  to within 20% of actual, indicating the need for a competent interpreter, good photographs and a minimum scale of 1 : 15,840. Sources of error and limits of applicability are discussed.

2169. VEENENBOS, J. S. Methods and costs of soil and land classification surveys when using aerial photographs. *Sols Africains, Paris* 4 (2), 1957 (122-35). 6 refs. [E.F.]

Compares (1) the increasing mean task area/field party/year using (a) ground survey, (b) photographs directly, (c) a photo-analytic plan (visiting only key sites of the pattern disclosed and interpolating and extrapolating for the final map) and (2) how costs for (a) (b) and (c) decrease with decreasing map scale.

2170. LARSEN, A. T. Visual aids for aerial observers on forest insect surveys. *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 149, 1957. pp. 4. 1 ref.

Eleven types of optical glasses were tested on surveys in Oregon and Washington and classed according to effectiveness in reducing glare, in penetrating haze, and in transmitting the true colour. Findings are tabulated.

## 6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

### 61. Forest Management: General, Theory and Principles

See also Nos. 1565, 2172-4.

2171. McGRATH, K. P. **The role of utilization in Australian native forest practice.** Government Printer, Canberra, 1957. pp. 16. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the interaction of economic and silvicultural problems, due to the fact that the forest industry is mainly based on overmature, scattered Eucalypt stands, expensive to extract and with a large amount of defective timber, and yet requiring removal of the overstorey in order to obtain adequate regeneration.

### 62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 1565, 1571, 1755.

2172. HUMMEL, F. C., and GRAYSON, A. J. **The achievement of sustained yield by varying thinning treatment and rotation.** *Forestry* 30 (2), 1957 (105-21). 4 refs.

In a forest with a very abnormal age-class distribution it may be possible to achieve a more normal distribution by a number of methods singly or in combination. A worked example is presented showing the implication of different combinations of two methods, namely felling before or after the normal rotation age, and varying the thinning grade. The example taken is a hypothetical block of 1200 acres which has been planted at the rate of 40 acres a year over a 30-year period and which consists entirely of Norway Spruce 2nd quality class. Nine combinations of felling and thinning treatments have been investigated, and for each the development during the conversion period of growing stock, increment, and yields computed. It was found that conversion to a sustained yield presents no particular difficulties, and need involve little sacrifice either in increment, or interest earned on the invested capital, especially if ample time is allowed for achieving normality. In all the nine conversion methods tested, yields rose sooner and fluctuated less than they would have done in the absence of conversion. Choice of method depends on the relative importance which the forest owner attaches to each of several facets of management. *Authors' summary.*

2173. HUTCHINSON, F. E., and HENRY, J. E. ***Pinus radiata* on land of N.Z. Forest Products Ltd.** *N.Z. Timb. J.* 3 (12), 1957 (33-5).

Describes site factors in the 175,000 acres planted (1925-37) in the North Island. Growth figures for 165,000 acres of *P. radiata*, averaged from 130 plots planted at 8 x 8 ft. are tabulated. The problems involved in (a) developing a normal distribution of age classes, (b) maintaining sustained yield, (c) maintaining permanently the industries developed to utilize the temporary excess of growing stock, are discussed.

2174. LEWIS, N. B. **Management for sustained yield of state *Pinus radiata* plantations in South Australia.** *Bull. Wds. For. Dep. S. Aust.* No. 7, 1957. pp. 30. 17 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the history of state afforestation, markets, mensuration (history and present practice), management, yield regulation, and the future outlook.

2175. MCKINNON, A. D. **Working plans in New Zealand.** New Zealand Forest Service, Wellington. 1957. pp. 20. 28 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Describes the development of the application and control of working plans in the state forests, and discusses some difficulties.

2176. HÜBSCHER, M. **Die Forsteinrichtung in Slowenien.** [Forest management and survey work in Slovenia.] *Schweiz. Z. Forstw.* 108 (10/11), 1957 (614-7). [G.]

Describes methods, including staffing and costs, used in making a survey of Slovenian forests and preparing working plans, many for the first time. They are usually drawn up jointly for private and state forests in a district. The méthode du contrôle is used for uneven-aged forests.

2177. VINEY, R. **Les différents modes d'application de l'affectation unique.** [The different ways of applying the single periodic block.] *Rev. for. franç.* 9 (11), 1957 (828-37). 13 refs. [F.]

Describes and criticizes several current methods, and suggests the considerations that should dictate the choice of one of them.

### 64. Forestry as a Business: General

See also No. 2593.

2178. AARESTRUP-FREDERIKSEN, J. **Overvejelser vedrørende rente i skovbruget.** [Reflections on interest in forestry.] *Dansk Skovforen. Tidsskr.* 42 (5), 1957 (286-95). [Dan.]

Discusses briefly and generally, the long-term view of interest, and the effect of large-scale inflation, increase of population, recreation areas and timber prices (with special reference to competition from the U.S.S.R.) on the Danish forest economy.

2179. CAMPBELL, R. A. **Ten years of experimental farm woodland management in the Southern Appalachians.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 83, 1957. pp. 11.

Gives data on growth, changes in number, diameter, volume etc. of growing stock, volume and value of assortments harvested, financial returns for work involved etc., for 4 typical woodlands, 2 of which are managed primarily for small dimensions, and 2 for saw- or veneer logs.



**65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation**

See also Nos. 1558, 1561, 1697, 1735-7, 1757, 1849-50, 1943, 1968, 2145, 2551.

2180. FISHWICK, R. W. The cost of establishing plantations in Bornu Province. A comparison of costs using hand labour and mechanical equipment. *Inform. Bull. Dep. For. Res. Nigeria* No. 39, 1957. pp. 8. 1 ref.

Details costs per acre of clearing *Guiera senegalensis* bush on light sands, stump removal, burning, staking out, and pit-planting of *Melia azadirachta* by exclusively hand labour and by Ferguson tractor. These respectively total 410 and 367 man-hours, and 297s. and 302s. Tractor running costs totalled < 12s./hr.; its general usefulness warrants purchase.

2181. Rapport van de Commissie Kostprijsberekening. Kostprijsberekening van de groveden of gewone pijnboom (*Pinus silvestris* L.) in een normal bosbedrijf. Derde en vierde groeiklasse. [Report of the Cost Price Calculation Commission. Calculating the cost price of *P. sylvestris* in an ordinary forest enterprise. Third and fourth growth classes.] Bosschap, Bedrijfschap voor Bosbouw en Houtteelt, 's-Gravenhage. 1957. pp. 26 + 28 tbls. [Du.du.]

[Cf. F.A. 15 No. 3947.] Calculations of cost price of the 3rd and 4th growth classes (sites of medium and poor fertility respectively) are based on a financial rotation of 50 and 55 years respectively, an interest rate of 3%, and current (1956-57) wage and price rates in the Netherlands. Tables are given showing yields for thinnings and final fellings; exploitation, cultivation and management costs; soil expectation value; cost price of felled and standing timber; management profits etc.

2182. BECKING, J. H. Een nieuwe kostprijsberekening voor het hout van de groveden in Nederland. [A new cost-price calculation for Scots Pine timber in the Netherlands.] *Ned. Bosb.-Tijdschr.* 29 (11), 1957 (264-70). [Du.]

Discusses the new calculation [see preceding abstract] and compares it with that for 1951.

2183. HENRIKSEN, H. A. Løvtrædyrkning set fra en tilvækstteknisk og investeringspolitisk synsvinkel. [Growing hardwoods from the aspects of increment and investment.] *Dansk Skovforen. Tidskr.* 42 (3), 1957 (169-92). [Dan.]

A comparison of volume and value yields in Bregentved forest shows that, although these are highest for Norway Spruce, its superiority over Oak and Beech is not great. The two hardwoods provide rather more elasticity as regards capital investment or withdrawal, in that severity of thinnings can be varied more widely than for Spruce, without serious reduction of increment, and that large and readily available reserves of timber exist. The chief disadvantage of hardwoods, viz. the long period before any return can be obtained, might be reduced by some form of selection system or by underplanting or planting in mixture with faster-growing trees. [Cf. F.A. 19 No. 1561.]

2184. BOLTON, LORD. Sycamore—some tentative suggestions. *Scot. For.* 11 (4), 1957 (167-8, 176).

Sets out, from experience on a private estate in N. Yorkshire, the economic reasons for growing *Acer pseudoplatanus*. A rotation of 75-85 years is suggested. A steady market for thinnings has been found, and the species has the additional advantage of being a soil improver. [Cf. F.A. 19 No. 1562.]

2185. HUDSON, L. S., and COOKE, P. T. Forest utilization—less valuable species. Forestry Commission of New South Wales, Sydney. 1957. pp. 12.

Describes the measures taken by the New South Wales Forestry Commission to encourage the use of secondary species, including the introduction of differential stumpage rates according to species and log grades, and reject-tree allowances to cover the cost of felling trees subsequently found to be useless.

2186. LYNCH, D. W. How many trees should be log graded to determine sales realization value. *Res. Note Intermt. For. Range Exp. Sta.* No. 45, 1957. pp. 5.

Based on the formula  $y = \frac{V_1 P_1 + V_2 P_2 + \dots}{V_1 + V_2 + \dots}$ ,

where  $y$  = value per 1000 bd. ft. of a given tree,  $V_1, V_2$  etc. = volume in bd. ft., lumber scale, of logs in the tree,  $P_1, P_2$  etc. = prices/1000 bd. ft. in each log, a table shows the sample size required for determining the gross price of sales of between 500 and 10,000 trees, with accuracies between 0.05 and 3%, and coefficients of variation between 0.05 and 0.20, at the 95% probability level.

2187. KRIEGER, H. Geldertragstabellen für den Wald als dynamisches Problem. [Financial yield tables—a dynamic problem.] Verlag M. & H. Schaper, Hanover. 2 vols. 1956. pp. 86 + pp. 106. [G.] Price DM30. From review in *Allg. Forst- u. Jagdztg.* 128 (8/9), 1956 (195).

A revision of the author's earlier book 'Measuring the economic potential of forests' 1929. Computations are based on current yield tables, and on the level of prices and costs, including wages, ruling in Rheinland-Pfalz on 1 Oct. 1950. The first volume consists of text, the second of tables.

**66. Costing of Logging Operations**

See also Nos. 1814-5, 1823, 2196-7.

2188. WILSON, A. K., and GREENWAY, G. H. Costs of logging virgin Ponderosa Pine in central Idaho. *Res. Pap. Intermt. For. Range Exp. Sta.* No. 51, 1957. pp. 15. 5 refs.

In 1953 and 1954 a total of 847 acres of virgin Pine divided into 16 compartments were logged, marking under two main systems: (a) selection of scattered deteriorating trees; (b) group selection involving clear felling up to 1 acre. In both, (i) high and (ii) low stand volumes were reserved, and large and small tractors used. Statistical analysis showed that the highest rate of felling and cross-cutting, was obtained from (a) (i) and the lowest from (b) (i). Data are given on the total costs and the production rates (in man and tractor hours) of felling, cross-cutting, and skidding for each of the 8 variables. The large tractor showed the highest skidding rate;

the small tractor proved uneconomical for the size of timber involved in this study.

2189. LETH, R. Våghållningskostnaden fördelning. [The distribution of road costs.] *Norrlands SkogsvFörb. Tidskr.* 1957 (3), (339–60). [Sw.sw.]

Gives some examples of problems arising in equitable distribution of costs among land-owners according to the use made of the roads (e.g. proportion of timber removed by road or water in different districts), and their solution.

**67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing**

See also Nos. 2198–9.

2190. OETTING, F. Forstliche Verlohnung, Grundlagenerfassung und Auswertung. [Wage accounting in forestry, ascertaining and evaluating the basic factors.] *Forst- u. Holzw.* 12 (22), 1957 (382–5). 7 refs. [G.]

Discusses data required for ascertaining all relevant information without unnecessary paper work, including labour costs of specific operations.

2191. VILLIERS, P. C. DE. Financial book-keeping and the forestry enterprise. *J. S. Afr. For. Ass.* No. 28, 1956 (6–16). 4 refs. [E.e.afrik.]

Discusses book-keeping systems best suited to developing plantations and describes the method of periodical valuation of growing stock, with a theoretical example from *Pinus patula*, for which a provisional yield table is given.

2192. [Business machines in the forest products industry.] *Lumberm.* 84 (13), 1957 (26 . . 42).

Contains 11 articles which include accounts of the experience of several logging and lumber companies in the use of automatic calculating and recording machines, e.g. in the costing of logging, log scale computation, tallying dimensioned stock (photo-electric), tallying for invoices, bills and payments, orders, day and month accounting, and reports and pay rolls. The notes cover desk calculations, punched-card equipment, electronic computers with punched cards, punched paper and magnetic tapes and microfilm. A possible development is the transmission of logging information by punched tape by teletype from the forest office. As equipment is rapidly being improved, large installations are better hired. A year's reconnaissance of requirements, 6 months' training for those involved and 3–4 years for final reduction of accounting staff are mentioned. A directory covers equipment makers (51), computer consultants (14) and service bureaux (25).

**68. Administration and Organization of Forest Enterprises**

**681. National (Federal, State) Forest Services and Administration**

See also No. 2589.

2193. BAS AUGUSTIN, L. V. Actividades del Servicio de Montes en la zona norte de Marruecos y futura organización del mismo. [The activities of

the Forest Service in the northern zone of Morocco and its future organization.] *Montes, Madrid* 13 (77), 1957 (345–52). [Span.]

**682. Private Forest Administration. Staff Questions in Private Forestry**

2194. CHAPPUIS, J. B. La gestion technique directe à portée de la petite et moyenne propriété forestière. [Direct management by trained personnel within reach of small and medium forest owners.] *Forêt, Neuchâtel* 11 (1), 1957 (4–7). [F.]

The author, a free-lance forestry consultant, discusses the advantages that smaller owners could obtain from the part-time employment of consultants against fixed fees, to manage their woodlands and deal with the organization of labour, marketing etc., and the conditions to be embodied in such agreements.

**684. Labour Management**

See No. 1792.

**685. Planning and Organization of Telecommunications**

2195. OLIN, R. W. Variety of forest uses for microwaves possible. *B.C. Lumberm.* 41 (10), 1957 (70).

Evidence given before the U.S. Federal Communications Commission, covering the potential use in forestry, for point-to-point communication, of waves of 890 megacycles, e.g. as a link with television cameras, from field party to data-processing machines, in felling operations, insect control, accounting, and the processing of timber (drying, gluing, surfacing).

**686. Planning and Organization of Buildings, Transport Installations (Roads etc.)**

See also No. 2189.

2196. STEINLIN, H. Seil oder Weg. [Cable or road?] *Allg. Forstztg.* 68 (23/24), 1957 (325–8). [G.]

A discussion of the merits of both, under varying conditions, and of planned combined use involving, in addition to a road network, a chain of permanent installations—anchorings, loading and unloading places, even supports, for recurrent use of a Wyssentype skyline cable system, illustrated by such a combined plan prepared for an area near Chur (Grisons).

2197. HUGGARD, E. R. Forest roads: the economics of extraction as affected by the date of road construction relative to the age of the plantations. *Emp. For. Rev.* 36 (3), 1957 (277–80).

It is shown that, for an assumed set of conditions, a graph can be produced that allows conclusions to be drawn regarding the correct timing of the road works relative to the age of the plantation.

2198. COULON, M. DE. Considérations économiques sur la construction des chemins forestiers. [Economic considerations in forest road construction.] *Schweiz. Z. Forstw.* 108 (9), 1957 (467–77). 6 refs. [F.g.]

Discusses the costs of road-building in Switzerland, which have risen considerably compared with other extraction costs, timber prices, and the general price



level, and are likely to rise further. Postponement of this essential investment is therefore considered bad policy, and its financing through loans not only justified but, in view of the secular inflationary trend, advantageous.

2199. BAUER, W. Die Wegebau-Politik des Bundes. [The forest road policy of the [Swiss] Confederation.] *Schweiz. Z. Forstw.* 108 (9), 1957 (478-89). 6 refs. [G.f.]

Traces the development of the policy of granting federal subsidies and gives a warning of the

unfavourable forestry, social, and economic consequences of reducing them.

2200. ROJAS Y ROJAS, J. M. Densidad de las vías de saca. [Spacing of extraction lanes] *Montes, Madrid* 13 (76), 1957 (259-60). [Span.]

Presents a simple formula for calculating the most economic spacing of extraction lanes, and applies it to the stands of Granada.

687. Planning and Organization of the Transport of Men, Supplies and Equipment  
See No. 1792.

## 7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

2201. GALLANT, M. N. Informe al gobierno de México sobre orientación y perspectivas de la industria maderera. [Report to the government of Mexico on the orientation and prospects of the timber industry.] Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 597, 1957. pp. 91. [Span.]

2202. CERMAK, F. Informe al gobierno del Paraguay sobre las industrias de la madera. [Report to the government of Paraguay on the timber industry.] Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 578, 1957. pp. 27 + 2 tbls. [Span.]

72. The Quantitative Aspects of Marketing.  
Demand, Consumption and Supply  
See also No. 2564.

2203. Yearbook of forest products statistics 1957. FAO, Rome. 1957. pp. 169. [E.F.Span.]

A number of changes are made in the tables, beginning with this issue, e.g. changed classification for pulp (mechanical, chemical, semi-chemical, and other) and the inclusion of particle board.

2204. [I.] European softwood conference. [II.] U.K. softwood market survey. *Timb. Tr. J.* 223 (4236), 1957 (71-4).

[I] Reports on the conference of importers and exporters held in Nov. 1957 in Paris, including figures for imports, consumption and stocks 1954-58, summarized for Belgium, Denmark, France, the Netherlands, the U.K., and W. Germany, which together in 1956 imported > 73% of the total exports of Sweden, Finland, Austria and the Soviet Union. These statistics fill out deficiencies in those of the E.C.E. Timber Committee. [II] Reports the U.K. position.

2205. Invoer van tropisch loofhout in Nederland. [Imports of tropical hardwoods into the Netherlands.] *Meded. Inst. Trop. Amst.* No. 125 (*Afd. trop. Prod.* No. 48), 1957 (33-6, 64). [D.u.e.]

Tables are given showing the value of imports from different countries in 1954-56 and total amounts of round and sawn timber by commercial species 1954-55.

2206. Quadros estatísticos. [Statistical tables.] *An. bras. Econ. flor., Inst. nac. Pinho* No. 9, 1957 (i-xlvi). [Port.]

[Cf. F.A. 18 No. 2028.] Figures for Brazilian wood production and exports, relating chiefly to the years 1955 and 1956.

2207. Australian timber supply: trends since the beginning of World War II. Forestry and Timber Bureau, Canberra. 1957. pp. 34.

Brings together statistics from a number of publications and unpublished records.

### 73. Prices

2208. BECKENDORFF, H. Probleme der statistischen Erfassung von Holzpreisbewegungen, am Beispiel der Buchenstammholzpreise von Oktober 1956 bis Juni 1957 aufgezeigt. [Problems in the compilation of statistics of timber-price movements, illustrated by prices of Beech stemwood from Oct. 1956 to June 1957.] *Holz-Zbl.* 83 (130), 1957 (1587-8). [G.]

Discusses the methods used in compiling German official statistics, the selection of representative assortments, methods of weighting means for quantities sold etc., and suggests the computation of current cumulative price indexes relating weighted means of each month to the weighted mean of the total sold since the beginning of the forestry year (1st October), as being more indicative of the economic effects of price movements than a comparison of monthly means without regard to quantities sold. A modification of this method, relating current price levels to the cost of the sawmiller's stocks based on a progressive period of the duration of an average turnover period, is also discussed.

2209. PERROT, C. Prix des bois et valeurs mobilières. [Wood prices and stocks and shares.] *Rev. for. franç.* 9 (10), 1957 (761-7). [F.]

Compares the evolution of wood prices for the period 1948-57 with that of French stocks and shares quoted on the Paris Bourse during the same period.

## 74. Trade Policy

See also No. 2591.

2210. BRAEUER, J. Was bedeutet das Kartellgesetz für die Forstwirtschaft. [The significance of the [W. German] Cartel Act [of 27 July 1957] for forestry.] *Forst- u. Holzw.* 13 (1), 1958 (10-5). 1 ref. [G.]

Discusses the probable effect of this act to regulate restrictive practices on arrangements or 'recommendations' regarding prices or the making available of supplies, joint sales, etc. Certain associations and co-operatives of forest owners are explicitly exempt from its provisions.

2211. MANTEL, K. Probleme der europäischen Wirtschaftsgemeinschaft und der Freihandelszone für die deutsche Forst- und Holzwirtschaft. [Problems of the Common Market and the Free Trade Area for German forestry and for the German wood industries.] *Holz-Zbl.* 83 (155/157), 1957 (1901-5). 3 refs. [G.]

A general discussion of the repercussions to be expected; the author foresees no serious difficulties.

## 75. Trade Customs and Usages

2212. RITCHIE, R. J. Timber sales policy and procedure [of the New South Wales Forestry Commission.] Forestry Commission of New South Wales, Sydney, 1957. pp. 8. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

## 79. Economics of the Forest Products Industries

See also Nos. 2171, 2185, 2192, 2376, 2500, 2570.

2213. KEYLWERTH, R., and HEGGEMANN, J. Holzwirtschaftliche Strukturen und Zeitreihen in graphischen Netzen. [Structure and development of

the wood industry as represented graphically.] *Holz Roh- u. Werkstoff* 14 (10), 1956 (377-88). 25 refs. [G.g.] P.R.

Discusses the feasibility of applying methods of graphical statistics (logarithmic probability graph papers) in such fields as employment, turnover, productivity (figures, features and trends), social subdivisions (age, income), position and trends of timber supply and demand, prices and freight charges.

2214. Struktur und Produktion der finnischen Sägeindustrie. [Structure and output of the Finnish sawmilling industry.] *Holz-Zbl.* 83 (121), 1957 (1469). [G.]

Some statistical data on the development of output by size of mill (1954-56), mean costs of stumpage, logging and transport (1951-56), wages, employment position, and shipping costs.

2215. MCINTOSH, M. Plywood production in West Africa. *Aust. Timb. J.* 23 (8), 1957 (89 . . . 105, 118, 120).

A detailed description of the installation, method of working and production of the African Timber & Plywood Ltd. factory at Sapele, Nigeria, producing 400 cu.m. of plywood weekly (record outturn 425 cu.m. week, equal to ca. 950,000 sq. ft. of  $\frac{3}{16}$  in.).

2216. Charcoal production in the United States. Division of Forest Economics Research, U.S. Forest Service, 1957. pp. 14 + 1 map. P.R.

The tables give figures of production, markets, prices, and kilns, and equivalent wood consumption in the U.S.A. The names and addresses of the 252 U.S. charcoal-manufacturing firms are listed.

2217. FRAEDRICH, K. Report to the Government of Indonesia on a program for the match, veneer, and plywood industry. Extended Technical Assistance Program, FAO, Rome. *FAO Report* No. 671, 1957. pp. 38. Limited distribution.

## 8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 2598.

2218. PHILLIPS, E. W. J.; SAVORY, J. G.; BLECHLY, J. D. The biological work of the Forest Products Research Laboratory, Princes Risborough. I. The work of the wood structure section. II. The work of the mycology section. III. The work of the entomology section with particular reference to the common furniture beetle *Anobium punctatum* Deg. *Proc. Linn. Soc., Lond.* 168 (1/2), 1957 (103-15). 8 refs. O.B.D.

2219. Timber research. Transfer of F.P.R.L. advisory services to T.D.A. [U.K.]. *Timb. Tr. J.* 224 (4243), 1958 (67).

The services taken over cover strength and use of structural timber, identification and utilization of species, prevention of fungal and insect attack, preservation, kilns and drying schedules, production and uses of plywood and allied products, and utilization of wood waste.

## 81. Wood and Bark: Structure and Properties

2220. HUGHES, J. F. The procedure used at the research unit of the Utilisation Division, Forest Department, Tanganyika for conducting pilot tests on timbers. *Tech. Note Util. Div. For. Dep. Tanganyika* No. 6, 1957. pp. 5 + [5].

With 3 forms and a table of standard defects for logs.

## 810. General Information on Woods

See also Nos. 1426-7, 1451-2, 1454, 1456, 1459-61, 1555, 1604.

2221. COX, H. A., and JOHNSTON, D. R. A second collection of wood specimens: 100 reproductions in colour. Tothill Press Ltd., 33 Tothill Street, London, 1957. pp. 205. Price £3. 3s.

The descriptions, photographs and drawings have



been selected from the series 'Specimen Woods', which appears regularly in *Wood*, and is referenced in *F.A.*

2222. **Specimen woods Nos. 262-264.** *Suppls. to Wood* 22 (10-12), 1957. Each pp. 2.

Mutenye (*Guibourtia arnoldiana*), New Guinea Walnut (*Dracontomelum* spp.), and African Padauk (*Pterocarpus soyauxii*).

2223. Houtsoorten. [Timber species.] Hout-instituut T.N.O., Rijswijk (Z.-H.), Netherlands. 1955-1957. [Du.]

A loose-leaf folder containing 13 two-page leaflets, each describing one commercial species with data on identification, structure (with a photomicrograph of the cross-section), durability, seasoning, mechanical and working properties, and uses. Species covered are: *Mitragyna stipulosa*, *Gossweileroendron balsamiferum*, *Turraeanthus africanus*, *Dicorynia paraensis*, *Sarcocephalus* spp., *Guarea cedrata*, *Cistanthera papaverifera*, *Mimusops heckelii*, *Mansonia altissima*, *Tarrietia utilis*, *Triplochiton scleroxylon*, *Gonystylus* spp. and *Ocotea rubra*.

2224. SPALT, H. A., and STERN, W. L. Survey of African woods. III. *Trop. Woods* No. 107, 1957 (92-128). 33 refs.

Descriptions of *Tiama* (*Entandrophragma angolense*, *E. macrophyllum* and *E. septentrionale*), *E. cylindricum*, *E. utile*, *Gossweileroendron balsamiferum*, *Guarea* (*G. cedrata* and *G. thompsonii*), *Khaya anthotheca*, *K. grandifoliola*, *K. senegalensis*, *K. ivorensis*, *Lophira alata* var. *procera*, and *Lovoa* spp. [Cf. *F.A.* 18 No. 4499.]

2225. [Woods of Uganda.] *Timb. Leaflet For. Dep.*, Uganda Nos. 29-33, 1957. Each pp. 2.

Each leaflet covers description of the tree and timber, availability, mechanical and physical properties, working qualities and uses, and recommendations on seasoning, preservation and saws. Species dealt with are: (29) Mushebeya (*Albizia glaberrima* var. *glaberrima*); (30) Namanuka (*Celtis durandii* var. *ugandensis*); (31) Mukoma-mukoma (*C. zenkeri*); (32) Akasinsa (*C. africana*); (33) African Satinwood (*Fagara macrophylla*).

2226. MCCOY-HILL, M. Timbers of East Africa. *Mringa Musingati. Meru Oak. Timb. Technol.* 65 (2220), 1957 (518).

*Cordia abyssinica*, *Vitex keniensis*.

2227. ARKWRIGHT, P. Know your timbers. (Some imported woods and their characteristics.) *Woodwkg. Ind.* 13 (2; 4-12), 1956 (99; 211; 273; 333; 397; 451; 509; 565; 613; 699); 14 (1; 2; 10), 1957 (39; 92; 525). P.R.

(26) Queensland Walnut (*Endiandra palmerstonii*). (27) *Guarea* (*G. spp.*). (28) *Mora* (*M. spp.*). (29) *Kapur* (*Dryobalanops* spp.). (30) *Ayan* (*Distemonanthus benthamianus*). (31) *Muninga* (*Pterocarpus angolensis*). (32) *Courbaril* (*Hymenaea courbaril*). (33) *Freijo* (*Cordia goeldiana*). (34) *Pyinkado* (*Xylia dolabriformis*). (35) *Eng* (*Dipterocarpus tuberculatus*). (36) African Mahogany (*Khaya* spp.). (37) Basswood (*Tilia americana*). (45) Cedar (*Cedrela* spp.).

2228. Wood—colors and kinds. *Agric. Handb. U.S. Dep. Agric.* No. 101, 1956. pp. 36.

Notes on range, properties and uses of 32 commercial species from the U.S.A., illustrated by coloured photographs of end-grained, edge-grained [radial] and flat-grained surfaces of each.

2229. STERN, W. L., and BRIZICKY, G. K. The woods and flora of the Florida Keys. *Introduction. Trop. Woods* No. 107, 1957 (36-65). 52 refs.

Covers topography, geology, soils, origin and distribution of the flora, vegetation (including Pine and hardwood forest and Mangroves), and botanical exploration, as an introduction to a study of the xylem anatomy of the woody plants of the area.

2230. PEREIRA, J. ARANHA, and MAINERI, C. Madeiras do Brasil. Sua caracterização, usos comuns e índices qualificativos físicos e mecânicos. [Brazilian timbers: description, common uses, and physical and mechanical properties.] *An. bras. Econ. flor., Inst. nac. Pinho* No. 9, 1957 (331-498). [Port.]

[Cf. *F.A.* 13 No. 3279.] This revised and expanded version covers 80 species.

2231. REHMAN, M. A. Less valuable species of timbers of India. Forest Research Institute, Dehra Dun. 1957. pp. 10. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Lists secondary timbers that are, or might be, used for packing cases, plywood, pencils, battery separators, textile mill accessories, sports goods etc., and others that could be so used after seasoning and/or preservation. [Cf. *F.A.* 19 No. 2268.]

2232. MASANI, N. J., and SETH, S. K. Utilisation of small dimension stock in the building industry through modern timber engineering. Forest Research Institute, Dehra Dun. 1957. pp. 4. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Includes a list of 15 fast-growing Indian species suitable for modern techniques, showing their strength and seasoning properties and suitability for preservative treatment.

2233. Maderas que pueden reemplazar al pino paraná. [Timbers that can replace Paraná Pine.] *Forestal, B. Aires* Nos. 3-4, 1957 (5; 4). [Span.]

Lists species (mainly S. American) under heads of their specific uses.

2234. Properties of thinnings of home-grown Serbian Spruce (*Picea omorika*). Progress report I. Consignment No. 906. Forest Products Research Laboratory, Princes Risborough. 1957. pp. 9.

Tests of the very small amount of material available suggested that *P. omorika* from Argyllshire closely resembled Norway Spruce from the same area in early growth rate and strength properties.

2235. REID, J. S. The properties and uses of Kahikatea (*Podocarpus dactyloides*). *Inform. Ser. N.Z. For. Serv.* No. 5 (rev.) 1956. pp. 8.

2236. REID, J. S. Beech timbers: properties and uses of *Nothofagus* species. *Inform. Ser. N.Z. For. Serv.* No. 17 (reprinted) 1955. pp. 38. P.R.

[Cf. *F.A.* 15 No. 3989.]

2237. La page des bois tropicaux. Niove. [Tropical woods. *Staudtia gabonensis*.] *Rev. Bois Appl.* 12 (9/10), 1957 (32). [F.]

2238. BANKS, C. H., and SCHWEGMANN, L. M. Notes on the properties of timber of South African grown *Eucalyptus obliqua* l'Hérit. *J.S. Afr. For. Ass.* No. 28, 1956 (57-60). 7 refs.

Covers habit, sawing and seasoning, structure, mechanical and working properties, preservation and uses.

2239. SCHNEIDER, K. *Afrormosia*, ein vielseitig verwendbares Tropenholz. [*Afrormosia* [elata?], a tropical wood of many applications.] *Holz-Zbl.* 83 (134), 1957 (1627). 1 ref. [G.]

Discusses the uses to which this wood is now being put in Germany, chiefly as a substitute for Teak (veneers, doors and windows, draining boards, floor blocks, ships and vehicles etc.), and its properties (dimensional stability, resistance to decay, corrosion of metals etc.).

2240. LAMB, G. N. Foreign woods. *Wood*, Chicago 62 (2), 1957 (68).

Jagua (*Genipa americana*).

2241. Eyong. [*Sterculia oblonga* and *S. elegantiflora*.] *Bois For. Trop.* No. 55, 1957 (21-4). [F.]

## 811. Structure, Identification

See also Nos. 2218-9.

2242. JACENKO-HMELEVSKIJ, A. A. Osnovy i metody anatomičeskogo issledovanija drevesiny. [Foundations and methods of the anatomical study of wood.] Izdatel'stvo Akademii Nauk SSSR, Moscow and Leningrad. 1954. pp. 337 + 2 plates. 10 pp. of refs. [Russ.]

A general work designed for advanced students. Part 1 deals with general matters, viz. terminology, microscopic preparations, description of wood structure, measurement of elements, and preparation of drawings and photomicrographs. Part 2 covers special applications: identification of living and fossil woods, use in systematic and phylogenetic studies, developmental studies (life of elements, wound reaction and tylose formation, heartwood formation) and fungus attack on living and dead wood, studies for ecological and silvicultural purposes, and technological studies. An appendix gives a selection of terms from the glossary of the International Association of Wood Anatomists in Russian, English, German and French. There are indexes to authors cited, subjects, and Russian and scientific names of plants.

2243. International glossary of terms used in wood anatomy. Committee on nomenclature, International Association of Wood Anatomists. *Trop. Woods* No. 107, 1957 (1-36). 1 ref.

Contains ca. 277 English terms and definitions, revising the 'Glossary of terms used in describing woods' [*Trop. Woods* 36, 1933, (1-13)], and is intended as a precursor to an illustrated multilingual glossary to be issued by the Association.

2244. MARTS, R. O. Wood and fibre structure by incident fluorescence microscopy. *Journal of the Biological Photographic Association*, Baltimore 23 (4), 1955 (151-5). From *abstr.* in *Mon. Abstr. Bull. Kodak Res. Lab.* 43 (2), 1957 (83). D.S.I.R.

Fluorescence can be used to reveal details in the structures of wood and fibre that are not readily seen by ordinary illumination. Both opaque and transparent samples have been studied. Opaque samples are illuminated by a ring condenser (Ultra-pak). Samples may be stained with fluorescent dyes to enhance the contrast and colour. The light source used was a D.C. carbon arc filtered by a 10% solution of  $\text{CuSO}_4$  and a filter transmitting from 300 to 400  $\text{m}\mu$ . Photographs of the equipment (including a 35-mm. camera) and photomicrographs of wood structures taken with it, are included. [Cf. *F.A.* 17 No. 1932.]

2245. FREY-WYSSLING, A. Use of the electron microscope in wood taxonomy. *News Bull. int. Ass. Wood Anatomists* Sept. 1957 (1-4). 9 refs.

A short review article.

2246. ASUNMAA, S. Image intensities in electron micrographs regarding sections of wood cells without contrast treatment. *Svensk PappTidn.* 60 (19), 1957 (708-12 + 9 photos). 42 refs. [E.e.sw.g.] P.R.

A discussion on the interpretation of variations of image intensities, illustrated by electron photomicrographs.

2247. JACENKO-HMELEVSKIJ, A. A. Drevesiny Kavkaza. Tom I: Golosemennye (Sagovnikovye—Ėfedrovye), Pokrytosemennye (Magnoliëvyë—Tutovyë). [Woods of the Caucasus. Vol. I: Gymnosperms (Cycadaceae—Ephedraceae), Angiosperms (Magnoliaceae—Moraceae).] Izdatel'stvo Akademii Nauk Armjanskij SSR, Erevan. 1954. pp. 674. Many refs. [Russ.]

A systematically arranged descriptive work, including not only native but also introduced woody genera. Both family and generic descriptions are given, and any known subgeneric distinctions are noted. Each generic description is accompanied by data, where available, on the properties and uses of the wood. Phylogenetic interpretations are given where possible.

2248. Sección de maderas: características y aplicaciones. Clave para la clasificación de las maderas de las coníferas españolas y del norte de marruecos. [Timber section: classification and uses. Key for the identification of the woods of Spanish and N. Moroccan conifers.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (89-94 + 8 plates). [Span.]

2249. CHENG, T. C., and WEI, K. Y. [Explanatory notes on wood anatomical features used in softwood descriptions.] *Repr. from Acta Botanica Sinica* 6 (1), 1957 (53-72 + 51 photos). 31 refs. [Chin.e.]

Lists and illustrates, with photomicrographs of Chinese conifers, 25 major and 18 minor characters used in identification.

2250. YU, C. H. [The wood structure of *Tsugoketeleeria* with special reference to its taxonomy.]



*Acta Botanica Sinica* 5 (2), 1956 (243–8 + 5 photomicrographs). 9 refs. [Chin.e.e.] L.S.

The anatomical structure of the wood of *Tsugo-Keteleeria longibracteata* showed no important differences from that of *Tsuga chinensis*, but marked dissimilarities from that of *Keteleeria evelyniana*, and the author doubts whether it is an intergeneric hybrid. [Cf. *F.A.* 19 p. 5.]

2251. CHENG, T. C. [The role of wood anatomy in the phylogeny of angiosperms.] Department of Forestry, Anhwei College of Agriculture. 1956. pp. 44 + 10 drawings & dgms., 19 photos. 226 refs. [Chin.e.]

Lists 37 features, chiefly those of the secondary xylem, illustrating structural evolution, condenses some papers indicating positions and affinities of plants, and discusses the origin of dicotyledons. *From author's summary.*

2252. BAILEY, I. W. Additional notes on the vesselless dicotyledon, *Amborella trichopoda* Baill. *J. Arnold Arbor.* 38 (4), 1957 (374–80). 8 refs.

Further work confirms that no vessels occur in the outermost xylem and that the rays are fundamentally of the primitive heterogeneous type-I form. The cambium and secondary xylem of all known vesselless dicotyledons are consistently similar, irrespective of plant size. The long-celled cambium of the group is similar to that typical of gymnosperms and, for this reason and others stated, the assumption that the primitive vesselless group formerly had vessels is held to be unwarranted.

2253. JANE, F. W. The structure of timbers of the world: 34. *Pterygota* and *Yellow Sterculia*. 35. *Abura* and *Alstonia*. *Timb. Technol.* 64 (2208; 2210), 1956 (518–20; 628–30).

(34) *Pterygota camerunensis*, *Sterculia oblonga*. (35) *Mitragyna ciliata*, *Alstonia* spp.

2254. GUPTA, B. Anatomy of stems of *Rauwolfia serpentina* Benth. *Sci. & Cult.* 23 (4), 1957 (200–1). 6 refs. E.M.B.

The elements are described, with measurements and drawings of cross sections. The secondary xylem has faintly marked growth rings.

2255. CHEN, C. L. Xylem anatomy of *Strophanthus* (Apocynaceae). *Trop. Woods* No. 107, 1957 (84–91). 10 refs.

Describes the xylem anatomy of *S. sarmentosus*, *S. congoensis*, *S. gratus*, *S. hispidus*, and *S. thollonii*. The genus can be separated from other Apocynaceae by irregular ragged marginal parenchyma and lack of septate fibres, and (for the examples examined) the presence of 1- to 3-seriate rays.

### 811.1. Anatomical Elements and Tissues

See also Nos. 2263–4, 2298, 2316, 2325, 2328–9, 2331, 2494–5, 2498.

2256. LIESE, W. Fine structure of bordered pits in conifer wood. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3621, 1957. pp. 4 + 2 dgms., 2 gphs. Transl. by M. Slade from *Proceedings, International Conference on Electron Microscopy, London*

1954, 1956 (550–4). [See *F.A.* 19 No. 911.] Limited distribution.

2257. LIESE, W. Zur systematischen Bedeutung der submikroskopischen Warzenstruktur bei der Gattung *Pinus* L. [Systematic significance of the submicroscopic wart structure [of cell walls] in the genus *Pinus*.] *Holz Roh- u. Werkstoff* 14 (11), 1956 (417–24). 28 refs. [G.g.] P.R.

[Cf. *F.A.* 16 No. 2148.] A total of 81 *Pinus* species were investigated by the polymerization replica method. Most species showed a very wide variation in both wart size and density of distribution. It is not yet possible to associate definite wart forms with definite species.

2258. MEIER, H. Discussion of the cell wall organization of tracheids and fibres. *Holzforschung, Berlin* 11 (2), 1957 (41–6). 14 refs. [E.e.g.] P.R.

The author discusses the physical and chemical structure of the various cell-wall layers and their terminology. The absence of double refraction in the innermost layer does not always imply the absence of a tertiary wall; this wall is present in Spruce, Birch and other species with hardly any double refraction. In these cases the microfibrils are arranged in a steep helix. He proposes the following terms for the various cell-wall layers: middle lamella, primary wall, transition lamella, secondary wall and tertiary wall; the terms 'tension-wood lamella' or 'gelatinous layer' are proposed for the special innermost layer of tension wood.

2259. WARDROP, A. B., and DADSWELL, H. E. Variations in the cell wall organization of tracheids and fibres. *Holzforschung, Berlin* 11 (2), 1957 (33–41). 28 refs. [E.e.g.] P.R.

A critical review of the literature, in which the authors submit that no valid reason has been advanced to justify any deviation from the cell-wall terminology suggested by Kerr and Bailey, in particular as far as the new names of 'tertiary wall' or 'tertiary lamella', and 'transition lamella' are concerned. It is pointed out that cytoplasmic debris deposited after the death of the cell often forms an incrusting membrane on the inner surface and this may have caused suggestions of a 'tertiary wall'. Particular attention is drawn to observed variations from the normal three-layered structure of the secondary wall with special reference to the cells of reaction wood. *From authors' summary.*

2260. BAILEY, I. W. Aggregations of microfibrils and their orientations in the secondary wall of coniferous tracheids. *Amer. J. Bot.* 44 (5), 1957 (415–8). 8 refs. O.B.D.

Evidence obtained by various techniques, including several electron micrographs, indicates that the striations visible in unmodified coniferous secondary walls are due to aggregations of cellulose microfibrils that are separated by elongated porosities oriented parallel to them. Such structures, visible under an ordinary microscope, provide a rapid means of studying variations in the orientation of cellulose in different parts of the secondary wall of single tracheids, in different tracheids of the same

tree, and in different coniferous trees. *From author's summary.*

2261. YU, C. H. [On the presence of trabeculae in the wood of *Juglans cathayensis* Dode.] *Acta Botanica Sinica* 5 (2), 1956 (249-51). 4 refs. [Chin.e.] L. S.

Illustrates and describes some rows of trabeculae extending radially across a number of fibre-tracheids and some parenchymatous cells in the secondary xylem of *J. cathayensis*, and discusses their possible significance for identification.

2262. SCARAMUZZI, G. Variazioni dimensionali delle fibre nell'ambito dell'individuo in alcune specie di *Eucalyptus*. (Nota preliminare.) [Variations of fibre dimensions within the stem of some *Eucalyptus* spp. (Preliminary note.)] *Pubbl. Cent. Sper. agric. for.*, Roma 1, 1956 (1957), (75-95 + 8 photos). [It.ite.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

Variations in fibre length, fibre-length/fibre-diameter, cell-wall thickness, cell-wall thickness/fibre-radius were examined in wood (a) with and (b) without growth rings. Samples of (a) were taken from *E. botryoides*, *E. rostrata*, *E. globulus*, *E. gomphocephala* and *E. maidenii*, and of (b) from *E. rostrata*, *E. gomphocephala*, and *E. maidenii*. With few exceptions variability within a growth ring or a non-ringed zone was low and irregular for all features. The widest range of variation, both radially and longitudinally was found in cell-wall thickness (20% and 10% respectively) in *E. maidenii*, variations in other features being very low longitudinally and slight radially. There were considerable differences between the two trees of *E. maidenii* that were analysed in detail, one showing an increase in values of all features studied from pith to bark, while in the second this applied only to cell-wall thickness.

#### 811.2. Special Features and Abnormal Structure

See also No. 1955.

2263. GHOSH, S., and RAO, K. R. Occurrence of tension wood and its effects on the properties of some Indian timbers. Forest Research Institute, Dehra Dun. 1957. pp. 4. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the effect of tension wood on cell structure and properties (e.g. uneven shrinkage during swelling) of some Indian hardwoods.

2264. WAHLGREN, H. E. Tension wood in Overcup Oak. *Rep. U.S. For. Prod. Lab.*, Madison No. 2089, 1957. pp. 6 + 4 photos, 3 gphs., 1 tbl. 8 refs. P.R.

Presents the results of measurements of shrinkage, % of fibrous area and comparative numbers of gelatinous fibres in *Quercus lyrata*, and of their statistical analysis.

#### 811.4. Growth Rings. Early and Late Wood

See also Nos. 2153, 2330, 2332.

2265. GRUDZINSKAJA, I. A. Vlijanie ivanovyh pobegov na formirovanie ložnyh godičnyh kolec u

duba (*Quercus robur* L.). [The influence of lammas shoots on the formation of false annual rings in Oak.] *Dokl. Akad. Nauk SSSR* 115 (2), 1957 (392-5). 10 refs. [Russ.] A.P.B.

Under favourable conditions, young Oak plants develop lammas shoots successively through the summer. Observations on 2- to 4-year plants showed that as much as 60% of the foliage of the plant might represent lammas growth. It was found, in agreement with earlier work, that the size of early- and late-wood vessels differs less in young plants than in adult trees, and the distribution of these elements is also different. The cambium lays down large vessels in the periods of active leaf-formation; in plants that produce successive lammas shoots the process of leaf-formation is more prolonged and less intensive, and the early-wood vessels, though of relatively small diameter, may be produced from May to August. Only plants with no lammas growth had a clear ring of large vessels at the beginning of the season, whereas those with 3 successive periods of shoot growth showed no peripheral ring of smaller vessels. No late-wood zone was developed between successive periods of shoot extension, and there is no evidence that false annual rings can be so formed. The latter appear to be caused by rather long periods of checked growth (e.g. in droughts or after frost damage to the leaves), followed by the development of proleptic shoots. It seems that they can be produced artificially by repeatedly stripping off the leaves, but not by a single stripping, as new foliage begins to appear as early as 5-10 days later.

#### 811.5. Sapwood and Heartwood

See also No. 2319.

2266. Tests for heartwood. *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (9).

Dimethyl Yellow and Methyl Orange are satisfactory for distinguishing sapwood and heartwood of European and American Oaks, but are unreliable for Japanese Oaks.

#### 812. Physical and Mechanical Properties

See also No. 2328.

2267. KENNEDY, D. E., and SMITH, W. J. Strength and related properties of woods grown in Canada. *F. P. L. tech. Note For. Prod. Lab. Can.* No. 3, 1956. pp. 7 + 4 tpls.

Separate tables for (1) conifers, (2) broadleaved spp., in (a) green, (b) air-dry condition.

2268. LIMAYE, V. D. Groupings of Indian timbers and their properties, uses and suitability. *Indian For. Rec (n.s.) Timb. Mech.* 1 (2), 1957. pp. 64 + 24 plates.

A revised and enlarged edition of the same author's 'Suitability and selection of timbers for different uses' [cf. *F.A.* 6 p. 235], now out of print. [Cf. also *F.A.* 19 Nos. 2231-2.]

2269. JAPING, H. W. Onderzoek naar de belangrijkste mechanische en fysische eigenschappen van 41 Surinaamse houtsoorten. [Tests of the most important mechanical and physical properties of 41



**Surinam wood species.]** *Meded. Inst. trop. Amst.* No. 122 (*Afd. trop. Prod.* No. 46), 1957. pp. 249. 70 refs. [Du.e.]

Methods and apparatus are described, results shown in graphs and tables, and summarized data given for each species. The 50-page English summary contains a shortened account of methods etc., but full details for the species. It is emphasized that the material was not fully representative and that values given may be too low.

2270. PALLAY, N. Sátorhegysegi Douglas-fenyő muszaki tulajdonságai. [Physical and mechanical properties of Douglas Fir from the Sator mountains.] *Erdőmérn. Főisk. Közl.* 1956 (2), (53–72). 6 refs. [Hu.hu.russ.g.]

The more important strength properties (data tabulated) of this 41-year material generally exceeded those published in literature.

### 812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also No. 2327.

2271. HEARMON, R. F. S. Some applications of physics to wood. *British Journal of Applied Physics*, London 8 (2), 1957 (49–58). P.R.

Reviews some of the more important physical properties of wood, particularly the hygroscopic, thermal, electrical and elastic properties. Vibration behaviour is also considered, with special reference to the effect of shear and rotatory inertia in flexural vibration, and to the connexion between frequency of vibration and elastic stability. *From author's summary.*

2272. BROWNE, F. L., and SIMONSON, H. C. The penetration of light into wood. *For. Prod. J.* 7 (10), 1957 (308–14). 6 refs.

Describes tests by photographic, photo-voltaic and spectro-photometric methods on Ponderosa Pine, Western Larch, and Redwood. Penetration of ultra-violet rays was negligible. Transmission of visible light varied largely with the colour of the wood and, presumably for this reason, was greater for sapwood than for heartwood of Ponderosa Pine. Penetration of infra-red rays was deeper and more uniform. Combined visible and infra-red light penetrated roughly in accordance with Beer's law. Woods turned brown in visible light, discoloration reaching beyond the layer penetrated by it, suggesting that infra-red light may be a factor in browning or that the latter is due to translocation of degradation products, formed chiefly in the very thin layer affected by ultra-violet light.

2273. SEEKAMP, H. Problematik und Systematik der Verfahren zur Prüfung des Verhaltens von Holz und Holzwerkstoffen im Feuer. [Problems and systematics of methods for examining the behaviour of wood and woody materials under combustion.] *Holz Roh- u. Werkstoff* 14 (8), 1956 (313–6). 6 refs. [G.] P.R.

Discusses the problems of fire testing from different angles, including the great variety of factors involved in the combustion process, and the standpoint of the interpreter of the test. As many as

possible of the following characteristics of the tested material should find expression in the results of the tests: ignitability, inflammability, flame spread, fire penetration and, if possible, combustibility in general. The available methods are systematized and briefly reviewed, and principles likely to form the basis of further experiments are enumerated. It is emphasized that the adoption of an internationally recognized method of testing fire resistance is of great importance.

2274. BRAUNS, O. Ein Gerät zur Bestimmung des Flammwiderstandes von Wandverkleidungsplatten. [An apparatus for determining the flame resistance of wall panels.] *Holz Roh- u. Werkstoff* 14 (7), 1956 (271–7). 1 ref. [G.g.] P.R.

Discusses the merits of existing fire-resistance tests based on the determination of ignitability, spread of flame, and fire penetration. Fires in buildings are characterized by (1) a slow rise in temperature (before the bulk of combustible material has begun to produce combustible gases), followed by (2) a sudden rise in temperature when the fire spreads over a much larger area owing to the ignition (sometimes explosive) of gases developed by the heated components, after which (3) the temperature remains almost constant. The author describes a specially designed apparatus for producing these fire conditions in order to test the flame resistance of wall panels (plywood, wall-boards etc.) and measure the mean temperature of the gaseous combustion products. Its construction (a fire chamber with propane-gas burner, air supply and viewing glass; blower, flow-meter, cylinder with CO<sub>2</sub> for extinguishing the fire, a cyclone for mixing the combustion gases, with a thermocouple and temperature recorder) is described in detail. The panels to be tested are placed on 3 walls and the ceiling. Although the apparatus cannot provide a true model of the fire (since the area of the panels varies as the square, and the air volume as the cube, of the linear dimensions, or of the scale), it is possible to obtain comparable results by varying the pressure of the propane gas (usually using 5–8 kg./sq. cm.) and the amount (or excess over theoretical value) of primary air (the minimum being 4 times the theoretical value). The maximum temperature attained in the tests is of little importance. The shape of the temperature/time curves can provide much useful information; it is possible to grade the wall panels for fire resistance, by the time in which a certain temperature, or certain different temperatures, have been reached during the test.

### 812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 1471, 2263–4, 2271, 2417, 2470, 2486.

2275. Es. Automatischer Feuchtigkeitsgehaltsprüfer. [Automatic measurement of moisture content.] *Holz-Zbl.* 83 (137), 1957 (1665). [G.]

Describes a German instrument designed for use on solids in pourable form, e.g. chips, and based on the difference in weight of small quantities (50 g.) weighed automatically before and after drying by infra-red heat, in one continuous operation. It may

be equipped with an automatic recording instrument, and coupled with apparatus to regulate moisture content.

2276. KAJANNE, P. **A rapid method for moisture determination [in wood and other cellulosic material.]** *Pap. ja Puu* 39 (8), 1957 (391-8). 4 refs. [E.e.] P.R.

The principle used is to extract the moisture from the material with pyridine, holding both in a hypodermic syringe, and to calculate the moisture % from the refractive index of the resulting liquid. A nomographic solution for this purpose is presented. The maximum absolute error is 1-2%. The method is suitable for materials of a fairly high moisture content, where the relative error will be small. The determinations take 5-15 min. *From author's summary.*

2277. CURRÒ, P. **Variazione stagionale dell'umidità e variazione della densità basale in 4 piante di *Eucalyptus camaldulensis* Dehn. [Seasonal variations in moisture content and variations in basic density in 4 trees of *E. rostrata*.]** *Pubbl. Cent. Sper. agric. for.*, Roma 1, 1956 (1957), (215-26). [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

Contains a study of the variations in moisture content (m.c.) and basic density (b.d. = dry weight/ground volume) according to season, height above ground level and distance from the pith, in stems of four 12-year-old trees of *E. rostrata* felled respectively in August, November, February and May. It was found that m.c. did not vary significantly with season, but decreased from pith outwards and from ground level upwards, while b.d. increased in the same directions.

2278. CURRÒ, P. **Variazione dell'umidità e variazione della densità basale in 15 piante di *Eucalyptus camaldulensis* Dehn. [Variation in moisture content and basic density in 15 trees of *E. rostrata*.]** *Pubbl. Cent. Sper. agric. for.*, Roma 1 1956 (1957), (227-38). [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

It was found that the decrease in m.c. with increasing height (*h*) above ground can be expressed by a linear relationship:  $m.c. = 123.72 - 1.59 h$ . The regular decrease in m.c. radially from pith to bark was the same in all directions, irrespective of aspect. The increase in basic density with increasing height above ground may be expressed as  $b.d. = 0.495 + 0.005 h$ .

2279. PATON, J. M., and HEARMON, R. F. S. **Effect of exposure to gamma-rays on the hygroscopicity of Sitka Spruce wood.** *Nature, Lond.* 180 (4587), 1957 (651). 2 refs.

In view of recent suggestions of the possibility of controlling insect attack in wood by exposure to gamma-radiation [see *F.A.* 18 Nos. 1076, 3461], it is of interest to see whether these radiations influence the properties of the wood itself. As a first step towards this end, the effect of exposure to gamma-radiation on the hygroscopicity of Sitka Spruce wood has been determined. It appears that hygroscopicity (and possibly other physical properties) of wood are affected only by very heavy doses of radiation and that at less than ca.  $10^7$  rad the effect is negligible.

This conclusion is in general agreement with findings on the chemical changes in Basswood on exposure to high-velocity electrons [see *F.A.* 13 No. 4215], that comparable exposures, approaching  $10^7$  rad, were required before any chemical change became appreciable. The doses mentioned in connexion with insect control did not exceed 60,000 rad and were often considerably less, and are unlikely to have any significant physical effect on the wood itself.

2280. **Wood-water relationships.** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (47-9).

The water-holding capacity of 17 species of wood was both determined experimentally and calculated; the majority of timbers took up 90-100% of the theoretical maximum. The saturation m.c. was decreased when suction was applied to the wood. When Scots Pine was treated with NaCl solution, its m.c./relative-humidity isothermal rose much higher for humidity values > 60% than did that of untreated wood, the isothermals showing hysteresis in both cases.

2281. RUNKEL, R. O. H., and LÜTHGENS, M. **Studien über die Sorption der Holzfaser. Zweite Mitteilung: Untersuchungen über die Heterogenität der Wassersorption der chemischen und morphologischen Komponenten verholzter Zellwände. [Studies on sorption by wood fibres. 2nd communication: Investigations on the differences in water sorption of the chemical and morphological components of lignified cell-walls.]** *Holz Roh- u. Werkstoff* 14 (11), 1956 (424-41). 126 refs. [G.g.] P.R.

[For Pt. 1 see *F.A.* 16 No. 895.] Sorption isotherms of wood-fibre preparations of various chemical composition and morphology, obtained from Beech and Spruce wood, were determined in a specially designed apparatus (illustrated and described). The preparations were examined by conventional chemical methods, by paper chromatography, and also morphologically by photomicrographs and investigation of swollen specimens. It was found that free enthalpy changes calculated from the isotherms showed a linear relationship to the hemicellulose content, the values for Spruce preparations being higher than those for Beech. By extrapolating the straight lines for lignin content and hemicellulose content to zero, the free enthalpy of pure wood cellulose was found to be ca. -730 cal./mol for both species. The free enthalpy for pure hemicellulose was similarly found to be ca. -2100 cal./mol, and that of lignin (Brauns lignin) to be -490 cal./mol. Corroboration of the already known data, and some new results, were obtained for dioxan lignin, cuproxam lignin, and the hydrophilic nature of the carboxyl and acetyl groups. In general, wet grinding increases the hydrophilic properties of wood, whereas preliminary high-pressure treatment decreases them.

2282. SPALT, H. A. **The sorption of water vapour by domestic and tropical woods.** *For. Prod. J.* 7 (10), 1957 (331-5). 13 refs.

Moisture sorption tests on White Spruce, Basswood, Redwood, and *Calophyllum brasiliense* at 90° F. confirmed the existence of distinct initial desorption isotherms. Variation between species



in the extent of hysteresis is attributed to differences in reversible H-bond development between adjacent cellulose molecules, and variation between sorption isotherms to different patterns of distribution of cell-wall capillaries.

2283. HIGGINS, N. C. **The equilibrium-moisture-content/relative-humidity relationships of selected native and foreign woods.** *For. Prod. J.* 7 (10), 1957 (371-7). 15 refs.

Data on equilibrium m.c. (e.m.c.) at r.h. between 21 and 93%, on fibre saturation points (f.s.p.), volumetric shrinkage (v.s.), sp. gr. and hysteresis are presented and discussed for *Picea sitchensis*, *Thuja plicata*, *Sequoia sempervirens*, *Ocotea rubra*, *Tectona grandis*, *Swietenia macrophylla*, *Nothofagus dombeyi*, *Pterocarpus dalbergioides*, *Dalbergia latifolia*, *Hymenaea courbaril*, *Chloroxylon swietenia*, and for Southern Yellow Pine, both natural and when impregnated with phenolic resin. In general, lower e.m.c. corresponded to lower f.s.p., particularly at the higher r.h., 6 species had a f.s.p. below 20% m.c., the lowest being *D. latifolia*, with 15.4%. V.s. ranged from 5.9% for heavily impregnated Pine to 20.2% for *N. dombeyi*. The values for e.m.c., v.s. and f.s.p. for heavily impregnated Pine were about equal to those of untreated *P. dalbergioides*, *D. latifolia* and *T. grandis*. Methods of measuring humidities over saturated salt solutions are described.

2284. BOSSHARD, H. H. **Über die Anisotropie der Holzschwindung. [On the anisotropy of wood shrinkage.]** *Holz Roh- u. Werkstoff* 14 (8), 1956 (285-95). 31 refs. [G.g.] P.R.

The author determined the shrinkage effects on 40- $\mu$  sections of 1  $\times$  1 cm. *Tsuga canadensis*, *Pinus strobus*, *Quercus borealis* and *Tilia glabra*, using a special microscope stage with HF heating [see *F.A.* 17 No. 3221]. Total shrinkages were denoted as follows: (1) in transverse sections: tangential shrinkage  $\beta_{qt}$  and radial shrinkage  $\beta_{qr}$ ; (2) in tangential sections: tangential shrinkage  $\beta_{tt}$  and longitudinal shrinkage  $\beta_{tL}$ , and (3) in radial sections: radial shrinkage  $\beta_{rr}$  and longitudinal shrinkage  $\beta_{rL}$ .

From these total shrinkages the following values were calculated: (a) coefficient of right-angle anisotropy: in transverse sections  $\epsilon_q = \beta_{qt}/\beta_{qr}$ , and in longitudinal sections  $\epsilon_L = \beta_{tt}/\beta_{rr}$ ; and (b) shrinkage quotients of: longitudinal shrinkage  $\eta_L = \beta_{tL}/\beta_{rL}$ , tangential shrinkage  $\eta_T = \beta_{qt}/\beta_{tt}$ , and radial shrinkage  $\eta_R = \beta_{qr}/\beta_{rr}$ . The values of  $\epsilon_q$ ,  $\epsilon_L$  and  $\eta_t$  were found to be always  $> 1$ . The effect of rays on tangential shrinkage is described by the equation  $\beta_{B,tt} = \beta_{B,tt} + \beta_{M,qt}$ , where  $\beta_B$ ,  $\beta_G$  and  $\beta_M$  are respectively the total shrinkages in larger test-pieces [not thin sections], in the main fibrous tissue, and in the rays. Since  $\beta_{qt} > \beta_{tt}$ , the shrinkage in the *Tt* direction must increase as the ray % rises. No significant relationship could be found between shrinkage in the direction *Rr* and the ray %. The direct effect of fibres and vessels on shrinkage is slight. A significant relationship exists between the density of a wood and its shrinkage: as the density increases, the *Tt* and *Rr* shrinkages increase, while the coefficients  $\epsilon$  decrease. Thus heavy woods are characterized by high absolute shrinkages and small

coefficients of *T/R* anisotropy. The effect of the microfibril direction on shrinkage is small. Confirming the findings of Frey-Wyssling [see *F.A.* 2 p. 48; 3 p. 135; 6 p. 26], the author considers that most of the shrinkage in conifers and broadleaved woods is related to the middle lamella, viz. not only to its thickness, but also to its degree of lignification. Partial delignification of the wood causes an increase in the shrinkage values, with simultaneous equalization of the shrinkage anisotropy, owing to a greater increase of shrinkage in radial than in tangential walls.

2285. SALLENAVE, P. **Rétractibilité linéaire des bois. [Radial and tangential shrinkage of wood.]** *Bois For. Trop.* No. 56, 1957 (45-50). [F.e.span.]

Describes the methods employed at the Centre Technique Forestier Tropical for the quantitative determination of radial and tangential shrinkage of wood, and gives data obtained for Azobe [*Lophira* spp.], *Eucalyptus* sp., Limbo [*Terminalia superba*], Lingue [*Azelia* spp.], Ekop Mayo [mixed secondary timbers], Bete [*Mansonia altissima*], and Teak.

2286. KONING-VROLIJK, G. M. C. **Het krimpen van vers gekapt esenhout bij drogen. [Shrinkage of freshly felled Ash in drying.]** *Tijdschrift der Nederlandsche Heidemaatschappij*, Arnhem 67 (6), 1956 (144-6). [Du.] C.G.B.

Samples from wide- and narrow-ringed wood from one tree and top and butt wood from another were studied. Drying was very slow where relative air humidity (r.h.) exceeded 70%, but at 20% r.h. an equilibrium moisture content of 5-6% was reached in 3 weeks. In drying from green to air-dry, tangential shrinkage was 2-4 times radial shrinkage. Results are tabulated.

2287. **[Moisture content and penetrability to impregnants of timber.]** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (30).

Tests with Scots Pine and Douglas Fir showed that, as their m.c. decreased gradually from fibre-saturation point to ca. 10%, an initial drop in the radial direction was followed by a steady increase in penetrability, while there was no initial drop in the tangential direction.

2288. BEARD, H. C., and OSGOOD, D. R. **Permeability of wood and other cellulose products to ethylene oxide gas.** *For. Prod. J.* 7 (8), 1957 (265-6). 2 refs.

Tests with this fumigant and decontaminating agent on various packaging materials showed that of 10 woods tested (using clear boards  $\frac{1}{4}$  in. thick) only Cypress, with a permeability of 15.24 mg./min./sq. ft. exceeded the limit of negligible permeability (3 mg.), values for Poplar, Oak and Maple being  $< 1$  mg. Most papers, cardboards etc. were highly permeable.

### 812.3. Density. Specific Gravity. Buoyancy

See also Nos. 1391, 2277-8, 2297, 2330-2.

2289. SEKHAR, A. C., and RAWAT, B. S. **Specific-gravity/strength-properties relationships for Indian timbers.** Forest Research Institute, Dehra Dun.

1957. pp. 6. 6 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Formulae derived from measurements on Indian woods were found to give values closer to measured ones than formulae used at Madison.

### 812.7. Strength Properties

See also Nos. 2219, 2267-70, 2289, 2316, 2327, 2332, 2354, 2386-7, 2482.

2290. DROW, J. T., DOHR, A. W., and BELLO-SILLO, S. **Mechanical properties of Ponderosa Pine from the Black Hills.** *Rep. U.S. For. Prod. Lab., Madison* No. 2090, 1957. pp. 8 + 4 photos, 6 tpls. 2 refs. P.R.

2291. YOUNGS, R. L. **Mechanical properties of [Northern] Red Oak related to drying.** *For. Prod. J.* 7 (10), 1957 (315-24). 26 refs.

Mechanical properties  $\perp$  to the grain were investigated in tension and compression between 80° and 180° F. and at m.c. between green and 6%, by static tension and compression tests, tests for creep and stress relaxation characteristics, and others. Most properties were significantly affected by heating at 180° for 30 days, most static properties being reduced linearly with rising temperatures, and curvilinearly with increasing m.c. *From authors' summary.*

2292. SUNLEY, J. G. **Basic stresses for various hardwood species.** *Timb. Technol.* 65 (2217), 1957 (349-50). 4 refs.

Tabulates, mainly from Princes Risborough data, the basic stress values (bending, compression  $\parallel$ , tension  $\parallel$ , compression  $\perp$ , shear  $\parallel$ , average and minimum modulus of elasticity) for 17 European and other broadleaved species.

2293. KING, E. G. **Creep and other strain behaviour of wood in tension parallel to the grain.** *For. Prod. J.* 7 (10), 1957 (324-30). 18 refs.

Tensile strength, maximum strain, creep values etc. were tested for Basswood, *Cedrela huberi* and *Dicorynia paraensis*. Creep occurred at stress levels < 10% of ultimate strength. There was a roughly linear regression between creep and stress up to the threshold of set, and a curvilinear one thereafter. In these tests, wood did not behave according to Hooke's law.

2294. COMBEN, A. J. **The effect of depth on the strength properties of timber beams with an analysis of the stresses and strains developed.** *Spec. Rep. For. Prod. Res., Lond.* No. 12, 1957. pp. 32 + 4 photos. 3 refs. Price 2s. 6d.

A full report of tests already briefly reported [see *F.A.* 18 No. 911].

2295. **Effect of depth on the strength properties of timber beams.** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (18-9).

It was found that, during the initial stages of loading, the distribution of strain is roughly linear over the whole depth of the beam. The position of the neutral axis is by no means constant. The proportional limit in direct compression occurs

when the stress is ca. 80% of the ultimate value. The modulus of elasticity in direct tension is slightly greater than that in direct compression.

2296. SAURMA-JELTSCH, H. H. VON. **Kritische Knickspannungen von Hölzern und Holzwerkstoffen im unelastischen Bereich. [Critical buckling stresses in wood and ligneous materials in the inelastic region.]** *Holz Roh- u. Werkstoff* 14 (7), 1956 (249-52). 4 refs. [G.g.] P.R.

Curves obtained for the buckling behaviour of wood in the inelastic region, obtained by the approximation methods of Tetmajer, Schwarz-Rankine, Natalis, Newlin, and von Ostenfeld, differ from one another and from curves drawn on the basis of the author's experiments. By changing the exponent of  $\lambda$  (slenderness) from 2 to  $\sqrt{2}$ , the author succeeded in developing a formula satisfying nearly all his results.

2297. CURRÒ, P. **Resistenza alla compressione assiale in funzione del peso specifico in *Eucalyptus camaldulensis* Dehn. [Relation between compression stress parallel to the grain and specific gravity in *E. rostrata*.]** *Pubbl. Cent. Sper. agric. for., Roma* 1, 1956 (1957), (239-49 + 1 tbl. + 2 photos). [It.it.e.e.] (1st World *Eucalyptus* Conference, Rome, 1956.)

2298. PAMFILOV, V. V. **Opređenje tverdoti traheid drevesiny sosny. [Determining the hardness of Pine tracheids.]** *Acta Botanica Sinica* 5 (2), 1956 (223-41). 13 refs. [Chin.Russ.] L.S.

Experiments were made on the microhardness of 110-year-old *Pinus sylvestris* wood from the Bryansk province in European U.S.S.R. The diagonal of the imprint left by a diamond under a standard load of 1 g. was measured on 28 specimens of  $10 \times 10 \times 20$  mm., and results tabulated. Tracheid hardness decreased with proximity to the early wood, that of late wood being 41.8% higher than that of early wood. Microhardness appeared to be significantly related to m.c. of wood, decreasing sharply as moisture increased. When the m.c. varied between 25 and 50%, differences of  $\geq 60\%$  were observed in the microhardness of the wood. (The m.c. values given are subject to error as they represent the mean for the whole specimen, not just the superficial m.c.)

2299. NORRIS, C. B. **Comparison of standard block-shear test with the panel-shear test.** *For. Prod. J.* 7 (9), 1957 (299-301). 7 refs.

Shear-strength values of matched solid wood specimens of Douglas Fir, Tulip Tree, Yellow Birch and Sweetgum tested by the standard test and the panel test originally developed for plywood [cf. *F.A.* 8 No. 1892; 11 No. 1983] were remarkably similar, despite known limitations of the former.

### 812.8. Workability. Working Properties

See also Nos. 2335-6.

2300. DAVIS, E. M. **Some machining properties of nine Liberian hardwoods.** *Rep. U.S. For. Prod. Lab., Madison* No. 2093, 1957. pp. 4 + 6 photos, 4 tpls. P.R.

Presents in tabular form the density, and the planing, shaping and turning properties of *Anopyxis*



*klaineana*, *Entandrophragma angolense*, *Gilbertiodendron* sp., *Gluema ivorensis*, *Haplormosia monophylla*, *Sarcocephalus diderrichii*, *Tarrietia utilis*, *Terminalia ivorensis* and *Monopetalanthus* sp. (later reclassified as *Tetraberlinia* sp.).

2301. **Machining properties of eight Philippine hardwoods.** *Wood-Worker, Indianap.* 76 (9), 1957 (8-10, 20...27). P.R.

Presents the results of tests on the planing, shaping, boring, mortising, turning and sanding of *Shorea negrosensis*, *S. polysperma*, *S. almon*, *S. squamata*, *S. philippinensis*, *Parashorea plicata*, *Pentacme contorta* and *Dipterocarpus* spp.

### 813. Wood Chemistry

See also No. 1345.

2302. Laboratorio General de Química Forestal. Química de la madera. [General laboratory of forest chemistry. Wood chemistry.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (69-70). [Span.]

Presents results of chemical analyses of wood of *Eucalyptus obliqua*, *Pinus pinaster* and *Populus alba* var. *pyramidalis*.

2303. GUILLEMAIN-GOUVERNEL, J. Étude chimique de différents types de peupliers. [Chemical analysis of different types of Poplars.] *Mémorial des Services Chimiques de l'État, Paris* 37 (4), 1952 (293-6); 39 (4), 1954 (231-3). [F.] L.S.

Presents results for wood of several Poplars of the sections *Aigeiros* and *Tacamahaca* or hybrids, giving cellulose and lignin content, extractives, furfural index and ash content in relation to dry weight, with data on site, age of tree, and position of sample in tree. Research into effects of variety, site factors, age etc. continues.

#### 813.1. Chief Organic Constituents.

##### Constituents of the Cell Wall

See also Nos. 2281-2, 2325-7, 2436, 2498.

2304. LAWSON, R. L., and STILL, C. N. The biological decomposition of lignin—literature survey. *Tappi* 40 (9), 1957 (56A-80A). 273 refs. P.R.

Covers world literature on: decomposition by digestive micro-organisms (lignin metabolism); decomposition by micro-organisms of soil and water; decomposition by wood-destroying organisms (fungi); decomposition of lignosulphonates; and coal formation.

2305. LYNESS, W. I., and SCHENKER, C. Isolation and characterization of a water-extracted lignin from Slash Pine wood. *Tappi* 40 (10), 1957 (791-4). 7 refs. P.R.

Presents the results of comparison of 'aqueous' lignin obtained by extraction from *Pinus elliotii* with 'native' lignins obtained from the same species and from *Picea mariana*; all 3 lignins were found to be virtually identical. 'Aqueous' lignin is obtained with greater ease and (for *P. elliotii*) in greater amount than the 'native' lignin.

2306. GRANQUIST, D. P. The oxidation of hydrogenated lignin from Douglas Fir wood. *Abstr. of*

*thesis*, in *Dissert. Abstr.* 17 (9), 1957 (1900). O.R.S.

A product obtained after rehydrogenation of the lignin followed by oxidation, esterification of the organic acids formed, and distillation of the esters, was identified as the diethyl ester of dimethyl malonic acid, and other products were presumed to be its homologues of higher molecular weight. Substances structurally related to thujic acid may exist in the wood and could give rise to dimethyl malonic acid.

2307. LINDGREN, B. O., and MIKAWA, H. The presence of cinnamyl alcohol groups in lignin. *Acta chem. scand.* 11 (5), 1957 (826-35). 6 refs. [E.e.] O.R.S.

A colour reaction has been worked out for cinnamyl alcohol groups and the presence of a small amount of the groups in Spruce lignin has been indicated. *From authors' summary.*

2308. SARKANEN, K., and SCHUERCH, C. Lignin structure. XI. A quantitative study of the alcoholysis of [Spruce] lignin. *J. Amer. chem. Soc.* 79 (15), 1957 (4203-9). 24 refs. O.R.S.

2309. NOKIHARA, E., et al. Lignin. VIII. Molecular weights of lignin sulfonates during delignification by bisulfite-sulfurous acid solutions. *J. Amer. chem. Soc.* 79 (16), 1957 (4495-9). O.R.S.

Deals with lignin sulphonates of *Tsuga heterophylla*, *Picea sitchensis* and *Acer saccharum*.

2310. FELICETTA, V. F., and MCCARTHY, J. L. Lignin. IX. Molecular weights of lignin sulphonates [from *Tsuga heterophylla*] as influenced by certain acidic conditions. *J. Amer. chem. Soc.* 79 (16), 1957 (4499-502). 9 refs. O.R.S.

2311. ADAMS, G. A. Water-soluble polysaccharides from White Spruce. *Tappi* 40 (9), 1957 (721-5). 15 refs. P.R.

Cold-water extraction of *Picea glauca* wood gave a 0-24% yield of crude polysaccharides which contained galactose, glucose, mannose, arabinose, xylose and trace amounts of rhamnose and uronic acid units. Properties of the two main polysaccharide components whose presence was discovered were determined.

2312. BISHOP, C. T. Constitution of an arabogalactan from Jack Pine (*Pinus banksiana* Lamb). *Canad. J. Chem.* 35 (9), 1957 (1010-9). 33 refs. O.R.S.

2313. LINDBERG, B., and MEIER, H. Studies on glucomannans from Norway Spruce: isolation and physical properties. *Svensk PappTidn.* 60 (21), 1957 (785-90). 25 refs. [E.e.sw.g.] P.R.

2314. ASPINALL, G. O., LAIDLAW, R. A., and RASHBROOK, R. B. The glucomannans from Sitka Spruce (*Picea sitchensis*). *J. chem. Soc.* Nov. 1957 (4444-8). 13 refs. O.R.S.

Hemicellulose fractions composed of *d*-mannose and *d*-glucose residues have been isolated from Sitka Spruce holocellulose. A methylated glucan and a methylated glucomannan have been prepared therefrom, hydrolysis affording the corresponding

2 : 3 : 6-trimethyl ethers. It is concluded that both glucan and glucomannan are linear polysaccharides composed of  $\beta$ -1:4-linked sugar residues. *From authors' summary.*

2315. MOST, D. S. **The sorption of certain Slash Pine hemicellulose fractions by cellulose fibres.** *Tappi* 40 (9), 1957 (705-12). 26 refs. P.R.

In sorption studies using radioactive C, the sorption equilibrium was not reached within ten days, and sorption was found not to be reversible with respect to concentration over a wide range of sorption rates. It is concluded from the results and published data that the strength-improving properties of the hemicelluloses increase with the increasing mannan content. *From author's summary.*

2316. KLAUDITZ, W. Zur biologisch-mechanischen Wirkung der Acetylgruppen im Festigungsgewebe der Laubbölzer. [The biological and mechanical effect of the acetyl groups in the mechanical tissue of the wood of broadleaved trees.] *Holzforschung, Berlin* 11 (2), 1957 (47-55). 30 refs. [G.g.e.] P.R.

When Birch and Poplar wood are treated with a 0.2% NaOH solution at 20° C., most of the acetyl is split off and the tensile strength decreases by 40-50%. This is explained by the acetyl being split off the polyuronic hemicellulose, with ensuing increase of hydration capacity. When carboxyl groups are split off, the exchangeable carboxyl groups are set free, thus causing an additional decrease of the bonding strength in the mechanical tissue. *From author's summary.*

### 813.2. Minor Organic Constituents.

#### Extractives. Cell Contents

See also No. 2446.

2317. ERDTMAN, H., and TOPLISS, J. G. **The chemistry of the natural order Cupressales. XVIII. Nootkatene, a new sesquiterpene type hydrocarbon from the heartwood of *Chamaecyparis nootkensis* (Lamb.) Spach.** *Acta chem. scand.* 11 (7), 1957 (1157-61). 6 refs. [E.e.] O.R.S.

A preliminary study of the neutral constituents gave terpenoid hydrocarbons, alcohols, compounds containing carbonyl, and carvacrol methyl ether. Nootkatene was isolated in an apparently pure state. *From authors' summary.*

2318. ENZELL, C., and ERDTMAN, H. **The chemistry of the natural order Cupressales. XIX. The occurrence of manool in *Cupressus sempervirens* L.** *Acta chem. scand.* 11 (5), 1957 (902-3). [E.] O.R.S.

The main neutral constituents extracted from the heartwood were carvacrol methyl ether and cedrol. The high boiling fraction gave manool, a diterpene alcohol characteristic of a section of the genus *Dacrydium*, not found before in other conifers. Minor neutral constituents of the wood extractives were *d*-borneol, *d*-bornyl acetate and sesquiterpenes. Carvacrol,  $\beta$ -thujaplicin and nootkatin were isolated from the acid fraction.

2319. HANCOCK, W. V. **The distribution of dihydroquercetin and a leucoanthocyanidin in a Douglas-Fir tree.** *For. Prod. J.* 7 (10), 1957 (335-8). 7 refs.

Analysis by colorimetric methods of stem sections from different heights of one tree showed that concentrations of both substances were greatest at the sapwood/heartwood boundary. Dihydroquercetin, apparently distributed throughout the woody tissue, was present in much greater concentrations than the leucoanthocyanidin, which appeared to be confined to the ray parenchyma, though also present in high concentrations in the inner bark. Their biological significance, particularly as regards heartwood formation is discussed.

2320. KAJANNE, P. **Investigations on the fatty acids of Pine wood and tall oil. II. Process induced dislocation of the C<sub>9</sub>-double bond.** *Pap. ja Puu* 39 (9), 1957 (417-22). 21 refs. [E.e.] P.R.

2321. KAJANNE, P., and NIEMINEN, M. **Investigations on the fatty acids of Pine wood and tall oil. III. Continued studies on the location of the double bonds.** *Pap. ja Puu* 39 (10), 1957 (471-6). 24 refs. [E.e.] P.R. [Cf. F.A. 15 No. 4102.]

2322. KAHILA, S. K., and RINNE, A. Y. E. **Investigations relating to extract of *Betula verrucosa* and of sulphite pulp.** *Pap. ja Puu* 39 (11), 1957 (526-30). 10 refs. [E.e.fi.] P.R.

The ether extract of fresh Birch wood was found to contain only small amounts of acid substances, the main part consisting of unsaponifiable neutral matter and fatty-acid esters. The ether extract of Birch sulphite pulp contained larger quantities of acid substances than that of the Birch wood and correspondingly smaller amounts of fatty-acid esters.

2323. **Wood extractives: East African Mulberry (*Morus lactea*).** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (45).

[Cf. F.A. 18 No. 936.] A colourless crystalline substance has been identified as dihydromorin, 3 : 5 : 7 : 2' : 4'-pentahydroxyflavanone, not previously described. Results of a detailed chemical examination are given.

2324. MORS, W. B., GOTTLIEB, O. R., and DJERASSI, C. **The chemistry of Rosewood. Isolation and structure of anibine and 4-methoxyparacotoin.** *J. Amer. chem. Soc.* 79 (16), 1957 (4507-11). 11 refs. O.R.S.

A new alkaloid, C<sub>11</sub>H<sub>9</sub>NO<sub>3</sub> isolated from wood of *Aniba duckei* and *A. rosaedora*, has been named anibine. A neutral companion substance proved to be 4-methoxyparacotoin, and attention is called to the structural similarity with constituents of the closely related Coto barks. *From authors' summary.*

### 813.8. Poisonous and Irritant Properties

See No. 1787.

### 814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 2402, 2441-2, 2444-5, 2455.

2325. CHOWDHURY, K. A., *et al.* **Difference in the behaviour of tissues in ancient plant remains and**



during chemical treatment. *Nature, Lond.* 180 (4586), 1957 (612-3). 4 refs.

Study of fossil and buried woods has shown that during long submersion of wood in water or soil, the parenchyma cells and rays are usually found to retain their original structure better than the fibres. Chemical investigation of this has so far been hampered by the difficulty of obtaining pure samples of parenchyma and fibres respectively from fresh wood. Recently, while working on Bamboo (*Dendrocalamus strictus*), the authors succeeded in separating mechanically its parenchymatous and prosenchymatous tissues, and they have now analysed these pure tissues chemically, at the same time examining them microscopically at different stages of delignification. The results showed that the two tissues behave differently in regard to delignification, the fibres (a) reacting faster than the parenchyma cells (b). After 6 hours, the lignin in (a) is reduced to 2.5% whereas in (b) it is 5.6%. After 5 hours' treatment, (b) are still intact whereas (a) have undergone considerable disorganization and are individually separate from one another. This difference in ability to resist delignification may explain why (a) disintegrate more quickly than (b) in fossil or buried wood.

2326. SKRIGAN, A. I., ŠIŠKO, A. M., and ŽBANKOV, P. G. O svojstvah  $\alpha$ -celljulozy, vydelennoj iz iskopaemoj drevesiny sosny tysjačeletnego vozrasta. [The properties of  $\alpha$ -cellulose isolated from fossil wood of *Pinus sylvestris* thousands of years old.] *Dokl. Akad. Nauk SSSR* 115 (1), 1957 (114-7). 12 refs. [Russ.] A.P.B.

Chemical methods and infra-red spectroscopy were used to analyse the cellulose of Pine wood. The material ranged from one-month-old shoots to fossil wood 140,000 years old. Results show that increase of age is accompanied by decreases of the degree of polymerization and of hydroxyl and acetyl groups, while  $\text{CH}_2$  groups tend to increase. [Cf. *F.A.* 16 No. 4542.]

2327. FUKADA, E., et al. The dynamic Young's modulus and the piezoelectric constant of old timbers. *Journal of Applied Physics, Japan* 26, 1957 (25-8). [Jap.?] From abstr. in *Chem. Abstr.* 51 (20), 1957 (15941). P.R.

Specimens were obtained from building timbers in ancient temples in Japan, the age of which ranged from 350 to 1300 years. Both Young's modulus and the piezoelectric constant increased with the time during the first 300 years and then decreased gradually. Quantitatively parallel change with time was observed in both magnitudes, showing that both are dependent on the crystallinity of cellulose fibres and that the ageing can be accounted for by the conflicting effects of crystallization and thermal decomposition over a long period of time.

#### 815. Effect of Growth Factors on Structure and Properties

See also Nos. 1537, 1558-9, 2262, 2265, 2303, 2482-4, 2486-7.

2328. PECHMANN, H. v. Methoden und Ziele der biologischen Holzforschung. [Methods and aims of

biological wood research.] *Mitt. StForstverw. Bayerns* No. 29, 1957 (142-57). 24 refs. [G.]

Briefly surveys some of the research carried out at Munich on the relation of growth factors, crown size, site, provenance etc., to wood structure and properties—density, dimensional stability, strength, reaction wood etc., and the further research needed, e.g. on the effects of fertilizers. [Cf. *F.A.* 17 No. 1998.]

2329. DADSWELL, H. E. Tree growth characteristics and their influence on wood structure and properties. Commonwealth Scientific and Industrial Research Organization, Melbourne. 1957. pp. 19. 31 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Several important aspects of tree growth in relation to wood properties are stressed. These are: (i) the close correlation between structure and properties, with particular emphasis on cell-wall organization, (ii) the definite growth pattern manifest in the structure of the wood as the tree develops from the seedling stage to maturity, and (iii) the changes in structure resulting from variations in external conditions during the life of the tree, all of which have considerable influence on the behaviour of the timber in use. It is suggested that in all tree-breeding work the wood of the parent trees should be assessed along with other characteristics. Mention is made of several wood features that can be used in such assessment, with particular stress on the role of fibre length, at least in softwoods. It has been observed that average lengths of 2 mm. and over for the wood of the first-formed growth ring are most desirable (the usual average is between 1 and 1.5 mm.) from the point of view of the pulp and paper industry and for the production of wood with the minimum of undesirable properties. Information on the fibre length of the first-formed wood in any tree can be obtained easily and without undue damage to the tree by using increment borings or specimens wedged from the bole. Finally, reference is made to the possible role of growth stimulants and the need to know the effects of such chemicals on the wood properties. From author's summary.

2330. LARSON, P. R. Effect of environment on the percentage of summerwood and specific gravity of Slash Pine. *Bull. Yale Sch. For.* No. 63, 1957. pp. 80 + 7 photos. 7 pp. of refs.

Data were collected from 29 sample plots distributed systematically throughout the natural range of *Pinus elliottii*. It was found that, within the range of ring widths normally encountered in Slash Pine stands, rate of growth exerted a negligible influence on both sp. gr. (a) and % of late wood (b), but (b) was strongly correlated with (a), accounting for 60% of its total variation. Age was the predominant factor controlling (b), the mean value of which increased from ca. 40 at 6 years to ca. 60% at 21 years, remaining fairly constant thereafter. Juvenile wood ( $\leq 6-8$  years) tended to have a low % of late wood. Considerable differences in (b), and therefore in (a), were found to exist between individual trees, that could not be accounted for by the factors

tested. On a plot basis, (b) increased from N. to S. and from W. to E. within the Slash Pine range. The only stand variables that could account for any of this variation between plots were those related to moisture-holding capacity of the soil; high moisture-holding capacity produced the lowest (b) after adjusting for rate of growth; (b) increased with increasing June + July precipitation and decreased with increasing January + February precipitation. The multiple regression of the two variables, June + July rainfall and depth to a fine-textured horizon, accounted for 55% of variation in (b) between plots. *From author's summary.*

2331. INOKUMA, T., SHIMAJI, K., and HAMAYA, T. [Studies on Poplars. (1) Measurement on fibre-length and specific gravity of Japanese Giant Poplar (*Populus japono-gigas*).] *Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (77-86). 7 refs. [Jap.e.e.]

The general trend in fibre length (l) with distance from the pith in a 3-year plant agreed with the findings of Sanio (1872) and Amos *et al.* [see F.A. 13 No. 1544]. Length decreased constantly from soil level up. No regular variation in sp. gr. was found. Both l and sp. gr. were extrapolated for the 10-year plant for comparison with those of 6 softwoods and 8 hardwoods used in the Japanese pulp industry.

2332. KRAEMER, J. H. Growth-strength relations of White Ash: a study of the effects of three influencing factors upon the mechanical properties of the wood of White Ash (*Fraxinus americana*, L.). *Sta. Bull. Ind. agric. Exp. Sta.* No. 640, 1956. pp. 27. 24 refs.

Material from 40 trees from 8 sites was tested for static bending, compression ||, compression ⊥, shear, hardness and toughness; the influencing factors of (a) sp. gr., (b) % late wood, and (c) rings/inch were determined on each test specimen. In general, (a) had the greatest influence on mechanical properties, followed by (b) and (c) in that order, in tests on green wood. For dry wood the order was (a), (c), (b).

## 82. Conversion, Shaping, Assembly and Finishing of Wood: General

2333. [The Vienna autumn trade fair.] *Int. Holzmarkt* 1957 (21), (11-24). [G.]

Includes a list of some 40 firms showing wood-working tools and machinery, veneers and plywood, insecticides and fungicides, and furniture, with brief accounts of their exhibits, and a description of a new machine for bundling edgings and cutting them to length (Firma Josef Weiss, Grossgmain, Salzburg).

2334. Erste Baseler Fachmesse 'Holz'. [The first trade fair for wood in Basle.] *Holz-Zbl.* 83 (123), 1957 (1506). [G.]

Describes some of the woodworking machines exhibited, including pneumatic presses and vices for small shops, and the Duplovit circular sawblade. This is fitted with hollow-ground hard-metal teeth of a novel shape, made in 3 tooth patterns, and is said to produce perfectly smooth cuts in solid wood, plywood, block-, chip- and fibreboards etc., with the added advantages of less noise and easy maintenance; also another patented tooth for circular saws,

the Hico, designed to produce smooth cuts without the danger of overheating.

2335. KOIDE, S. [Study of special natures of wood for wood working [i.e. on the cutting and processing of wood].] *Wood Ind., Tokyo* 11 (5), 1956 (236-43). [Jap.e.] P.R.

[See following abstract.]

2336. KOIDE, S. A study on the cutting and processing of wood. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3147, 1957. pp. 19 + 27 dgms. Transl. by J. Otis from *Wood Ind., Tokyo* 11 (5), 1956 (236-43). Limited distribution.

Discusses the characteristics of wood as they affect cutting (e.g. size of elements, and their arrangement, abnormal structure, effect of cutting direction and external pressure), the action of the blade entering and passing through the wood, the blade angle and direction, sharpening, dulling in use, cutting speed, types of blade and saw for cross-cutting, lengthwise cutting, planing, and results of some studies on cutting with a rotary lathe. Work is still in progress, and only a general outline is given, with numerous diagrams but no supporting data.

2337. Work-holding by vacuum. *Timb. Tr. J.* 224 (4243), 1958 (82).

Describes a new system of work-holding, developed by Hydraulics and Pneumatics Ltd., Wolverhampton, having special advantages in processes where it is difficult to hold the work (including fragile and easily distorted material) securely and precisely in the position required for some particular operation. Any work having a reasonably flat surface (e.g. furniture parts) can be held by 'vacuumation' on a range of face-plates (3-10. in. in diam.) mounted on universal vices. The face-plate has a central valve and the vacuum (> 200 lb. lifting power) is sealed with a soft medium. Both hands of the operator are then free to work in the most accessible position. A similar method for driving awkwardly placed screws is also noted.

2338. HĂRĂȘTĂȘEANU, E. Combaterea zgomotului în industria de prelucrare a lemnului. [Noise reduction in the woodworking industry.] *Industr. Lemn.* 6 (9), 1957 (328-35). 6 refs. [Rum.russ.g.f.e.]

Discusses the sources of noise, permissible level and methods of control, in joinery shops.

## 821. Barking

See also Nos. 1788, 1790, 1802-3.

2339. FOBES, E. W. Saw-log barkers. *Rep. U.S. For. Prod. Lab., Madison* No. 2091, 1957. pp. 10 + 1 gph. P.R.

Describes the introduction of relatively inexpensive mechanical barkers into the American sawmilling industry, gives the % of mills with barkers for 7 sawmill sizes (by output), discusses the relation of timber size to barker capacity and pulp-chip quality requirements, describes the main types of barkers used in sawmills, and considers future trends.



## 822. Saws and Sawing

2340. GENSMAN, L. R. Remote control systems for setting sawmill carriages. *Pap. Amer. Soc. mech. Engrs.* No. 57-SA-74, 1957. pp. 8. P.R.

Describes the present position and foreseeable trends in the use of remote set-work systems, more than 300 of which have been installed in sawmills in the U.S.A. in the past 4 years.

2341. HYLER, J. E. Modern sawmilling. *Parts 76-80. Sth. Lumberm.* 194 (2434-2438), 1957 (35 ... 40, 45 ... 50; 41 ... 48; 53 ... 60; 45 ... 52).

Operation and uses of circular and sash gangsaws.

2342. FONKIN, V. F. Novyj GOST na ramnye pily. [New Soviet standard specification for frame-saws.] *Lesn. Prom.* 1955 (10), (26-8). [Russ.]

Discusses the Soviet Standard GOST 5524/55, in force from July 1, 1955, relating to spring-set and swage-set frame-saw blades. The following factors are dealt with: chemical composition of the steel; hardness of blades; sharpness angle; smoothness of blade surface; tooth shape and pitch.

2343. A Stenner band mill for Russia. *Timb. Tr. J.* 223 (4241), 1957 (79-80).

Describes Stenner of Tiverton's 13-ton mill, of ca. 190 h.p., for sawing hard- and softwood logs up to 48 in. diam. and 22 ft. long, which is operated by one-man control of the loading, dogging, turning, setting and cutting. Speeds up to 9000 ft./min. are allowed for. Major components are all of steel, cast iron being too brittle for the cold climate.

2344. MAYER, P. Konstruktion und Wirkungsweise der Horizontalgatter. [Design and operation of horizontal frame-saws.] *Holz Roh- u. Werkstoff* 14 (4), 1956 (155-9). [G.g.] P.R.

Discusses modern types and describes in detail the design features specially important for faultless operation.

2345. Vorschubeinrichtung an Bandsägen. [Feeding mechanism for bandsaws.] *Holz-Zbl.* 83 (122), 1957 (1486). [G.]

Briefly describes a patented device for sawing wood blocks of even length into thin boards, in which the block is firmly held between spring-loaded clamps on the end-grain and fed to the saw hydraulically, 3 or more carriages being used for continuous working—loading, feeding and return empty.

2346. SERGEEV, E. E. Pily s pljuščenymy zub'jami na raspilovke tverdistvennogo syr'ja. [Saws with swage-set teeth for the rip-sawing of hard woods of broadleaved species.] *Lesn. Prom.* 1955 (9), (25-7). [Russ.]

Experimental sawings of Oak logs, using frame-saws with swage-set teeth, were carried out in 1952-54; tooth angles were: hook 15°; sharpness 47°; clearance 28°; swage 0.7 mm. on each side. It was found that the specific work decreased as the feed rate per tooth increased, while the respective curves obtained for two different depths of cut showed equal specific-work differences for any feed per tooth. The formula  $K = 7.2/C^{0.25} + 0.02h/b$  is developed, where  $K$  = specific work (m. kg./c.c.),  $C$  = feed per tooth (mm.),  $h$  = depth of cut, and  $b$  = kerf width

(both in mm.). This formula has given satisfactory results throughout the study. It was established that saw-blades with swage-set teeth have greater strength and stability when sawing hard woods than those with spring-set teeth, and allow a higher feed rate, which results in a cleaner cut. Another formula was developed to show the relationship between power consumption and feed per tooth, viz.

$$N_e = (K'bnHf_1^{0.75}/6,120,000\beta^{0.75})\Sigma h^{0.25}Z^{0.75} + (\alpha n f_1 H/6,120,000\beta t)\Sigma h,$$

where  $N_e$  is the power consumption (KW);  $K'$  the specific work at  $C = 1.0$  mm. (kg./c.c.);  $n$  speed of the saw-frame spindle (rev./min.);  $f_1$  the maximum filling of the gullet area (sq. mm.);  $t$  tooth pitch (mm.);  $\alpha$  intensity of friction force (kg./c.c.);  $\beta$  coefficient of chip compression;  $H$  stroke of the frame (mm.), and  $Z$  number of blades in the frame. A nomogram based on this formula is presented for evaluating the feed per tooth.

2347. OLKKONEN, E. Mahdollisuudet kehäsaahan kiertokankivaurioiden ehkäisemiseksi. [Possibilities of avoiding ruptures in connecting rods of frame saws.] *Pap. ja Puu* 39 (9), 1957 (427..434). [Fi.f.e.e.] P.R.

The ruptures examined were typical fatigue failures. It has proved possible to detect failures in an initial stage by using ultrasonic equipment. *From author's summary.*

2348. LUBKIN, J. L. A status report on research in the circular sawing of wood. Volume 1. *Technical Report, Central Research Laboratory, American Machine & Foundry Company, Greenwich, Conn.* No. CRL-T-12, 1957. pp. xviii + 193 + [23]. 84 refs. P.R.

A detailed survey of world literature, the first of two volumes, dealing with the following: (1) definitions, notation, and a few geometrical preliminaries; (2) circular-saw performance as a function of (a) cutting and feed speeds, (b) the relative size and orientation of saw blade and work piece; and (3) effects of tooth geometry, and number and pitch of teeth on circular-saw performance. Includes: (i) sources of wood-machining research information, (ii) calculation of chip kinetic energy and associated average cutting forces, and (iii) list of references and author index.

2349. ANOPOL'SKIĬ, M. G. Kruglopil'nye stanki dlja prodol'noj raspilovki tonkomernogo syr'ja. [Machines with circular saws for rip-sawing small-diameter logs.] *Lesn. Prom.* 1955 (12), (24-7). [Russ.]

Having analysed the various advantages of using twin and multiple circular saws instead of frame-saws for the squaring and rip-sawing of small-diameter logs, the author recommends that suitable circular saws should be developed as quickly as possible in order to increase both the yield and output of sawn timber.

2350. Eine neue Zahnhöhenprüfflehre. [A new instrument for measuring the height of saw teeth.] *Holz-Zbl.* 83 (124), 1957 (1518). [G.]

An instrument designed for every type of circular

or straight saw-blade, showing excesses and deficiencies in height on a scale. (Manufactured by Vollmer Werke, Biberach.)

### 823. Planing, Cutting of Mouldings.

Chiselling, Mortising and Tenoning. Boring.

Turning

See also No. 1789.

2351. **Planing investigations.** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (19-22) + 1 photo.

Results of tests with a surface-planing machine having a specially designed feeding device indicate that the mean tangential force imposed on the wood, calculated from the net power demand, is in general ca. 5% less than the resistance to feeding. Cutting tests carried out with low-speed apparatus show that the cutting force increases with the depth of cut, but there is no simple formula relating the force to the other variables. Tests with a prototype high-speed rectilinear machine, in which the chip characteristics and dimensions were studied for different speeds, cutter angles and depths of cut, show that the graphed experimental points agree well with the relationship  $A \sqrt{t} = \tan(B/nt^{1.5})$ , where  $t$  is the thickness and  $n$  the number of 'flats' per inch length in the 'lobster-back' chips, while  $A$  and  $B$  are constants depending on the properties of the wood and other cutting conditions.

2352. PAHLITZSCH, G., and LIEGMANN, E. Geräuschuntersuchungen an einer Abriecht-Hobelmaschine. [Investigations of noise in a smoothing planer.] *Holz Roh- u. Werkstoff* 14 (4), 1956 (121-35). 3 refs. [G.g.] P.R.

The author's investigations show that, while no changes in design can reduce noise in cutter-blocks with knives arranged parallel to the cutter-block axis [P cutter-blocks], those with helically set knives [H cutter-blocks] can have their noise values reduced 10-16 phons below those of P cutter-blocks. In idle-running P cutter-blocks, the noise is created by air-pressure disturbance originating close to where the knives are fixed; the sound generated is amplified by the benches, whose lips lie very close to the cutter-block. This amplification can be reduced by reducing pressure differences to a minimum, which can be achieved by a special lip design, embodying for example, openings in the lips. When the machine is operating, the main noise creator is the work-piece, which is set into vibration by the cutter-block. In machines with H cutter-blocks, 'idle' and 'working' noise are almost the same, and the noise does not greatly depend on the design of the lips.

2353. FESSEL, F. Spanabhebende Formgebung durch Kopierfräsen. [Moulding of wood by copying cutter-heads.] *Holz Roh- u. Werkstoff* 14 (4), 1956 (142-8). [G.g.] P.R.

### 824. Forms of Joint. Jointing and Assembly

#### 824.1. Nailed Joints

See also Nos. 2386-8.

2354. BROCK, G. R. The strength of nailed joints. *Bull. For. Prod. Res., Lond.* No. 41, 1957. pp. 32 + 4 photos. 9 refs. Price 2s. 6d.

[Cf. F.A. 18 No. 960.] Deals with the strength of joints in which the nails are subject to lateral load, i.e. the loads or forces on the members joined act in a direction perpendicular to the longitudinal axis of the nails. The nails were round, chequered-head wire nails without surface treatment, and were driven into the side-grain without pre-drilling. The work included tests comparing the strength of joints with nails in double and single shear. The dependence of joint strength on number and diameter of nails, thickness of members, sp. gr. and moisture content of the wood, and the direction of loading in respect to the grain of the wood was examined. Empirical equations are developed in which the maximum load that can be sustained by a joint, and the loads to cause particular slips in a joint, are expressed in terms of the sp. gr. of the wood and the diameter of the nail. Although only one species of softwood [*Pinus sylvestris*] was used in the tests, it is assumed that the essential data will apply to softwoods generally. The equations, with other results of the investigations, are therefore used to develop permissible lateral loads for nails in single and double shear in various softwood species. *From author's summary.*

2355. STERN, E. G. Wood, plywood or steel gusset plates for nailed trussed rafters. *Bull. Wood Res. Lab. Va. polyt. Inst.* No. 29, 1957 pp. 12. P.R.

Discusses the design details for nailed trussed rafters assembled with wood, plywood and steel gusset plates. Results available indicate the most economical jointing procedures to be those that can utilize all nails in double shear and allow driving of all nails from one side. *From author's summary.*

2356. STERN, E. G. Nailing of subflooring, with supplement on effectiveness of square barbed versus threaded bronze nails in Redwood. *Bull. Wood Res. Lab. Va. polyt. Inst.* No. 31, 1957. pp. 11. P.R.

Results of tests are presented. The threaded 'sinker' nail was found to be superior to the 8d common and barbed nails.

#### 824.8. Glues and Gluing

See also Nos. 2380, 2512.

2357. HINKEN, E., and MARRA, A. A. A study of some factors affecting the gap filling properties of wood adhesives. *For. Prod. J.* 7 (9), 1957 (286-92). 3 refs.

In continuation of previous experiments [cf. F.A. 15 No. 1828] a study was made over a period of 4 weeks of the influence of thickness of adhesive film, type of adhesive (including the addition of a walnut-shell filler), rate of cure, and moisture content of the wood, on the loss of bonding strength due to shrinkage of the film with time. An epoxy resin was least affected by film thickness and time; a furfuryl-modified urea gave slightly higher strength but only at low thicknesses, and lost some strength with time; and a polyvinyl acetate emulsion gave highest over-all strength, increasing with thickness, but was slightly less stable.



2358. PLATH, E., and HERTLING, W. Beitrag zur Messung der Abbindevorgänge von schnellen Holzleimen. [Measurement of glue-setting processes in quick-setting wood glues.] *Holz Roh- u. Werkstoff* 14 (5), 1956 (189-90). [G.g.] P.R.

Describes a new method for the rating of quick-setting wood glues in terms of tensile strength  $\perp$ . The test-piece consists of two laths  $60 \times 20 \times 10$  mm., glued together to form a cross. Statistical analysis of numerous test series proves the new method to be sufficiently reliable; because of its simplicity it lends itself to routine tests.

2359. SODHI, J. S. Die Abhängigkeit der Bindefestigkeit von Phenol-Formaldehyd-Harzen verschiedener Kondensationsstufen von der Viskosität. [Dependence of the bonding strength of phenol-formaldehyde resins of various condensation stages on viscosity.] *Holz Roh- u. Werkstoff* 14 (8), 1956 (303-7). 2 refs. [G.g.] P.R.

Laboratory tests were made to determine the dependence of bond strength (tensile and compression) on a number of factors. Low-temperature storage of the glues is highly recommended. To attain maximum values of tensile and compression strength it is necessary to comply strictly with the prescribed condensation time. The pH of the hardener should not exceed 3. The proportion of fillers should be  $\geq 5\%$ .

2360. MILLER, G., and COLE, T. J. S. The dielectric properties of resin glues for wood. *For. Prod. J.* 7 (10), 1957 (345-52).

Conductivity varied widely between different formulations. It was little affected by changes in frequency between 0.5 and 32 megacycles but rose steeply for most glues with rising temperatures. Age of the mix did not affect it in resorcinol and phenol-resorcinol glues. The dielectric constant, where tested, showed no significant change with time, little with temperature, and a slight decline with rising frequencies.

2361. LEXA, J. Porovňovací zkoušky životnosti močovinnového a fenolresorcinformaldehydového lepidla. [Comparative tests of the durability of urea and phenol-resorcinol-formaldehyde glues.] *Dřev. Výskum* 2 (1), 1957 (74-80). [Cz.cz.russ.g.e.] P.R.

Results of tests (Soviet standard GOST test-pieces) with the urea glue Umacol C and the phenol-resorcinol-formaldehyde glue FR 80, when subjected to artificial ageing.

2362. BLOMQUIST, R. F., and OLSON, W. Z. Durability of urea-resin glues at elevated temperatures. *For. Prod. J.* 7 (8), 1957 (266-72). 3 refs.

Test data for 3 years' continuous exposure of plywoods and laminated joints to temperatures between  $80^\circ$  and  $158^\circ$  F. (a range frequently reached for long periods in roof constructions) showed that all 11 glues tested weakened under these conditions, their order of performance being generally similar to that of their original strength. High-solid liquid formulations tended to be better than powdered or low-solid liquid formulations, and hot-pressed than cold-cured glues.

2363. PLOMLEY, K. F., GOTTSTEIN, J. W., and HILLIS, W. E. Tannin-formaldehyde adhesives. *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 234, 1957 (6-8).

Tannins can be substituted for phenol at about one-third the cost in waterproof plywood adhesives, but additions of a fortifying resin (amounts varying with the plywood species) are required to maintain the glue shear strength, wood failure % and resistance to 72-hour boiling, required in standard tests. Typical laboratory results are tabulated and other information given to show the performance of Klinki Pine plywood bonded by adhesives so prepared from tannins of Mangrove (*Rhizophora* and *Bruguiera* spp.), Wandoo (*Eucalyptus wandoo* and *E. accedens*) and Black Wattle (*Acacia decurrens* var. *mollissima*). [Cf. F.A. 15 No. 733.]

2364. COUFAL, J. W. Gluing high pressure decorative laminates. *For. Prod. J.* 7 (8), 1957 (29A-32A).

Discusses actual and potential uses of such plastic laminates, and the merits of different types of adhesive—contact cement, urea, casein and polyvinyl—in bonding them to wood or other cores.

2365. SCHULTZ, F. Leimauftragmaschinen. [Glue-spreading machines.] *Holz Roh- u. Werkstoff* 14 (4), 1956 (149-55). [G.g.] P.R.

Illustrated description of nearly all the glue-spreading machines obtainable and used in Germany, all German-made save one American.

2366. POUND, J. Practical R.F. heating for the wood industry. Heywood & Company Ltd. 1957. pp. viii + 198. 46 refs. Price 30s. P.R.

Contains the following sections: (1) adhesives; (2) general principles of R.F. heating; (3) generators; (4) jigs; (5) through or transverse heating; (6) glue-line heating; (7) stray-field heating; (8) miscellaneous applications; (9) matching; (10) other heating methods; (11) economics of R.F. heating, and (12) glossary of terms.

2367. POUND, J. The use of R.F. heating in the joinery trade. *Timb. Technol.* 65 (2220), 1957 (506-8). 1 ref.

Illustrated description of the use of R.F. for door lipping, scarf and edge jointing.

## 825. Cleaving. Adzing. Mechanical Comminution

See also No. 1790.

2368. Splitting firewood. *Timb. Tr. J.* 224 (4243), 1958 (82).

Describes a roller-fed machine with a 15 ton/day output made by M. Glover and Co. Ltd., Leeds, and designed for block timber (e.g. cut-down sleepers). It is not suitable for use on round logs. A slabbing knife to split awkward sections before feeding is incorporated, and the length and thickness of the split sticks are adjustable. Drive can be from a line shaft or direct motor. With V-belt transmission a 5-h.p. motor is required.

2369. MASSÉ, G. **The importance of proper chipping.** *For. Prod. J.* 7 (10), 1957 (55A-56A).

A description, by a member of the Guillet Co., Auxerre, France, of the Guillet chipper, designed to produce thin, uniform chips of adjustable dimensions from a wide range of wood and industrial residues. A shallow pan rotates at low speeds (2 to 10 rev./min.) on an axis inclined at 48°. In this the wood is stationary and the cutters swing into it, cutting the chips || to the grain. In one model, designed for fairly regular logs, the wood is fed by gravity into hoppers, subdivided into compartments roughly fitting the log diameters; in another, irregular-sized wood, such as brushwood and mill residues, is held in place and pushed down to the cutters by means of compressed-air clamps. Examination at the Centre Technique du Bois in France showed that mean fibre length of 0.2-mm. Birch chips was ca. 1 mm., almost the same as that of Birch logs, damaged fibres amounting to < 1%. The bark is practically pulverized by the impact of cutter heads and can be easily separated by sifting, so that for many operations the barking of wood before chipping becomes unnecessary. Output, up to ca. 3 tons dry weight/hour using ca. 50 h.p., is lower than with other chippers, but quality is better and costs are lower, particularly where barking is eliminated. The machine produces uniform chips from woods of widely different sp. gr. or hardness. It is considered particularly suitable for tropical conditions, and for smaller mills using hardwoods in cold pulping processes.

#### 826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See No. 1789.

#### 829.1. Finishing

2370. SCHARFF, R. **Complete book of wood finishing.** McGraw-Hill Book Co., Inc., New York, 1956. pp. [8] + 298 + 50 photos. Price \$4.50. P.R.

Contains the following sections: woods and their accepted finishes; preparing the surface for finishing; methods of applying finishes; stains; fillers and sealers; varnishes; shellac; lacquers and synthetics; rubbing and polishing; wax and oil finishes; paint and enamel finishes; plywood and composition-board finishes; novelty and decorative finishes; reviving old finishes; finishing schedules and specifications; with a glossary of wood-finishing terms, including materials (over 200 items).

2371. Es. Saugspanneinrichtung für Bandschleifmaschinen. [Section clamping for belt sanders.] *Holz-Zbl.* 83 (146), 1957 (1773). [G.]

Describes a device for holding boards perfectly flat, consisting of a number of suction plates and a pump driven by a small electric motor through connecting tubes etc. A pressure of 28 kg. is developed at each plate. The device can be fitted to existing machines.

2372. VEER, J. J. G. **Moisture blistering of paints on wood.** *For. Prod. J.* 7 (10), 1957 (342-4). 8 refs.

Tests indicated that if water continuously wets the back of a painted panel, blisters will develop, without a temperature gradient. Otherwise, conditions must be such as to allow for condensation of free water behind the paint film. Formation of blisters was affected by the thickness of the test panel and by the species of wood. It was most rapid and severe on Eastern Cedar, and least so on Aspen.

#### 83. Timber Manufacturing Industries and Products. Uses of Wood as Such

##### 831. Fuelwood and Various Types of Rough Timber

See also Nos. 2368, 2421-5.

2373. CANTIANI, M. Ricerche sperimentali sul rendimento della lavorazione delle traverse ferroviarie di cerro e di faggio. [Studies on the yield of sleepers from logs of *Quercus cerris* and *Fagus sylvatica*.] *Ital. for. mont.* 12 (4), 1957 (157-63). 2 refs. [It.it.f.]

Tables give yields of (a) square-edged, (b) round-edged sleepers from logs of different dimensions, for each species separately, and also volume of logs 2.6 m. long for different top diameters.

##### 832. Mills, Their Functions and Products

2374. SMITH, W. C. **High pressure pneumatic conveying in the wood products industries.** *For. Prod. J.* 7 (10), 1957 (390-5).

A technical description and a discussion of its uses and advantages over low-pressure systems or conventional belt conveyors in transporting chips, sawdust etc. Compaction by pressure loading increases loading capacity by ca. 20%. Costs are compared and numerous practical instances given.

##### 832.1. Sawmills and Planing Mills

See also Nos. 1790, 2214, 2340-53, 2373, 2401.

2375. KERSTEN, G. Entwurf DIN 68201—Holz, Schnittverlust—Verschnitt und Verschnittzuschlag. [German Draft Standard No. 68201. Timber loss in cutting: two-way conversion factors.] *Holz-Zbl.* 83 (149), 1957 (1807). [G.]

Discusses proposed terms and their definitions, and formulae for computing either conversion losses or timber requirements from the dimensions of the finished article etc., to be embodied in this standard. It is designed for the sawmilling, woodworking and building industries.

2376. ARIMIZU, T. [Application of linear programming to forestry. (1) Optimum mixture of logs in the sawmill.] *Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (49-76 + 1 tbl.). 23 refs. [Jap.e.e.]

The usual criterion of sawmill profit in the U.S.A. is recovery value by grade classes for each 1000 bd. ft. of each diameter class put through the mill, subtracting from this value the logging, stumpage and manufacturing costs. Profit so defined is zero or negative for logs below a certain diameter and is maximized for logs of a certain diameter. Recovery value has no parallel relation to recovery % in terms of volume. To determine the relation between



maximum feasible profit or minimum feasible costs of the total mill output and all the possible different combinations of log size would require years of experience. Using data gathered in a fortnight's sampling in a large mill (Crosset Lumber Co., Arkansas) the author applies 'linear programming' to solve this problem of the optimum mixture of all logs. The variables of the model are given in detail. Compared with the usual method, this solution makes use of fewer of the less profitable logs (feasible in the single-tree selection method locally followed) and also fewer of the more profitable logs (more in consonance with growing-stock distribution) and arrives at a profit 9% greater than the former. The method is suitable for mills (generally large) in a position to realize maximum profit.

### 832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 2215, 2217, 2219, 2231-2, 2357 *et seq.*, 2383, 2386-8, 2397, 2400, 2493, 2504, 2508.

2377. **Plywood.** Timber Development Association, London. 1957. pp. 49. 8 refs.

A practical guide, with sections on properties, manufacture, adhesives, grades (of imported and British plywoods), sizes and thicknesses, types (with definitions), decorative veneers, shaped and moulded plywood, finishes, protective and fire-retardant treatments, structural uses, choice of type, applications, grading rules, and characteristics and properties of wood species used.

2378. PFEIFFER, J. R., and OVERHOLSER, J. L. **Oregon hardwood plywood.** *Inform. Circ. Ore. For. Prod. Lab.* No. 10, 1957. pp. 32. 12 refs.

Limited studies have indicated the possibility of making plywood from the 9000 million bd. ft. of hardwoods available in Oregon [cf. *F.A.* 18 No. 837]. In particular, Tanoak [*Lithocarpus densiflorus*] seems well suited to the production of rotary-cut veneer, with tanbark as a by-product, and of lumber from logs unsuitable for veneer. Some indications are given of costs and prices.

2379. CLARKE, E. H., and KNAUSS, A. C. **Veneer recovery from Douglas Fir logs.** *Res. Pap. Pacif. Northwest. For. Range Exp. Sta.* No. 23, 1957. pp. 13.

Tabulates data on the volume recovery from veneer-grade logs, based on a study of 777,000 bd. ft. from Oregon and Washington.

2380. REED, H. B. **The production gluing of random-length core stock.** *For. Prod. J.* 7 (10), 1957 (352-4).

Describes operations in which random-length boards are rip-sawn to 2  $\frac{9}{16}$  in. width, edge-glued, laid-up on a belt, and cured in an electronic gluing press. The panels are automatically cut into 100-in. lengths. *From author's summary.*

### 832.3. Match Factories

See No. 2217.

### 833. Timber in Buildings and Engineering Structures (Manufacture and Use).

2381. WINTER, H. **Autoren-Verzeichnis zur Bibliographie der Veröffentlichungen über den Leichtbau und seine Randgebiete im deutschen und ausländischen Schrifttum aus den Jahren 1940 bis 1954.** [Author index to Bibliography of German and foreign literature for 1940-54 on light-weight construction and allied subjects.] Verlag Springer, Berlin. 1957. pp. 103. [G.E.] Price DM8.00. *From review in Holz-Zbl.* 83 (116), 1957 (1414).

[Cf. *F.A.* 18 No. 1015.] Contains ca. 10,000 names.

2382. HOROWITZ, H. **The Building Research Institute and the Building Research Advisory Board [U.S.A.]** *For. Prod. J.* 7 (10), 1957 (57-A-58-A).

Describes the functions and set-up of these bodies, both units of the Division of Engineering and Industrial Research of the National Academy of Sciences—National Research Council. The first is a technical membership organization, holding conferences and publishing proceedings, Abstracts of Building Science Publications etc.; including reports of the Advisory Board, a body of experts whose duties include the carrying out of special studies for Federal Agencies etc.

### 833.1. Building Components and Fittings: General

See also Nos. 2355-6.

2383. VANDYKE, J. C. **Recent developments in engineered timber construction.** *Pap. Amer. Soc. mech. Engrs.* No. 56-A-136, 1956. pp. 8. P.R.

Describes the use of laminated wood in churches, industrial buildings and houses, and for the construction of non-magnetic ships; also discusses its decorative uses, building codes, fire insurance questions and fire-safety considerations.

2384. STALEY, L. M. **Rigid frame wood construction—its development and application to farm structures.** *Abstr. in Agricultural Institute Review, Ottawa* 12 (3), 1957 (27). O.R.E.

Describes how the principle of the three-hinged arch is utilized by combining common lumber and plywood into building frames with spans up to 38 ft., easily fabricated by unskilled labour.

2385. SONNTAG, G. **The corrugated webbed girder.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3405, 1957. pp. 3 + 1 dgm., 3 photos. Transl. by E. Bolza from *Holz-Zbl.* 82 (86), 1956 (1073). Limited distribution. P.R.

2386. NORÉN, B. **Påkänningar i trätakstolar: resultat av modellprovningar. [Strains and stresses in timber roofs: results of tests on models.]** *Medd. svenska TräforsknInst. (Träteknik)* No. 86B, 1957. pp. 16. 6 refs. [Sw.sw.e.] P.R.

Presents in graphs and tables the results of tests on glued and nailed roof structures of the W type and a common Swedish type with extended rafters, collar beam and posts and braces.

2387. RADCLIFFE, B. M. **The design of timber roof truss with nail-glued connections.** *Pap. Amer.*

*Soc. mech. Engrs.* No. 56-A-180, 1956. pp. 7 + 3 photos, 6 dgms. P.R.

Presents a model analysis of truss behaviour under load, in which electric-resistance strain-gauges were used. A method for determining experimentally the distribution of forces and bending moments throughout the model truss is given, with calculations for the test of a king-post truss. Model constants are derived and the method of designing full-sized trusses from the test results of model tests is explained. Calculations for the design of a king-post truss of 32 ft. span are used as examples of the procedure. Test results, from the standpoint of both strength and stiffness of the full-size truss, are presented. Emphasis is given to the deflection behaviour of the lower chord as well as the ultimate strength of the structure.

2388. PERCIVAL, D. H. **Nail-glued roof trusses from low-grade hardwood lumber.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 649, 1957. pp. 26. 17 refs.

In a study at the Wood Research Laboratory, Purdue University, satisfactory nail-glued roof trusses were made from low-grade hardwoods, at a total cost per truss of \$12.45. Only softwoods have hitherto been used for this type of construction. [Cf. F.A. 17 Nos. 2071, 3338.]

2389. ARMSTRONG, F. H. **Timbers for flooring.** *Bull. For. Prod. Res., Lond.* No. 40, 1957. pp. 18 + 8 plates. 7 refs. Price 2s. 6d.

The behaviour of wood subjected to abrasion is reviewed, the research leading to the development of a laboratory abrasion test for wood is described, and results of tests on a large number of hardwoods and softwoods, and correlation of the tests with service trials are discussed. The factors influencing the resistance of hardwoods and softwoods to abrasive action are examined and analysed, including those of density and structure, which form the basis of selection of flooring timbers. A classification for hardwoods and softwoods according to their probable suitability for specific types of floor is compiled as a guide to selection. *From author's summary.*

2390. TINTO, J. C. **Maderas para la industria del parquet.** [Timbers for the flooring industry.] *Forestal, B. Aires* No. 2, 1957 (5). [Span.]

Lists some S. American woods having suitable properties for flooring.

### 833.2. Special Uses in Residential, Commercial and Public Buildings

2391. **Trends in utilization of wood and its products in housing [in Europe].** European Office of the United Nations, Geneva. 1957. pp. 49.

A joint FAO/ECE publication, with 58 statistical tables, dealing mainly with dwelling houses.

2392. [Trends in home construction.] *For. Prod. J.* 7 (8), 1957 (19A-28A).

A group of articles by different authors on: the unexplored facets of wood in house construction (C. Hornbostel); the modular system of house construction and its possible effects on (a) furniture (J. E. Kinnebrew), (b) millwork (W. A. Norman);

trends in the utilization of wood in the house building industry to-day and in the future (L. G. Haeger); and the prefabricated house (W. J. Worth).

### 833.3. Special Uses in Factories and Workplaces

See Nos. 2419, 2426.

### 834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 2231, 2427.

2393. **Cedar shakes stage big come-back.** *Lumberm.* 84 (10), 1957 (40...45).

Describes the small-scale production of handsplit-resawn, tapersplit, and straightsplit shakes [roofing shingles] from *Thuja plicata* in Oregon, Washington, and British Columbia, which produced 317,261 squares in 1956. A table shows quantities of different sized shingles needed to cover different areas of roof.

2394. AARON, J. R. **The use of home-grown timber in packaging and materials handling.** *For. Rec. For. Comm. Lond.* No. 35, 1957. pp. 29. Price 2s. 6d.

Gives results of inquiries made from a number of manufacturers on the use of home-grown and imported materials, with notes on the principal species used, and recommendations on seasoning, grading etc. to make the home-grown material more acceptable.

2395. **Packung und Verpackung. Rückblick auf die Anuga 1957.** [Packaging. A review of Anuga [Foodstuffs and beverages exhibition] 1957.] *Holz-Zbl.* 83 (131/132), 1957 (1607). [G.]

A general discussion of trends in packaging, where wood is holding its own, where it is being increasingly replaced, and where it is advancing, e.g. in pallets, of which a new type is described with a detachable frame which converts a flat pallet into a walled container.

2396. **Cereto para tomate, tipo único de 6 kgs. [Tomato crate—single type holding 6 kg.]** *Hoja divulg. Serv. Madera, Madrid* No. 4, 1957. pp. [2]. [Span.]

Describes, with diagrams, a recommended type of crate for the export of fresh tomatoes.

### 835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also No. 2231.

2397. **Sección de maderas: características y aplicaciones. Estudio de las estructuras encoladas de madera aplicadas a la manufactura de culatas y culatines de armas de fuego.** [Timber section: classification and uses. Glued laminated structures for the manufacture of gun stocks.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (95-101 + 1 plate). [Span.]

Reports some results of tests of the properties of a large number of woods, to discover their suitability for the manufacture of glued laminated gunstocks.



2398. JIRŮ, P. Hygrostats. [Wooden hygrostats.] *Dřev. Výskum* 2 (1), 1957 (103-31 + 9 gphs., 6 tpls.). 17 refs. [Cz.cz.russ.g.e.] P.R.

Tests with Spruce, Pine, Lime and Beech wood hygrostats (a few mm. thick and 10-100 g. in weight), to compare their results with those given by gravimetric or psychrometric methods, showed a difference of 3.1-9.6% between the hygrostatic and gravimetric methods of determining the m.c. of wood. The error in using hygrostats to determine the hygroscopic equilibrium in a kiln amounted to a few %. Their use is not recommended for routine work, and should be confined to measurements in parts of the kiln not easy of access. To reduce the hysteresis, hygrostats should be stored in humid places, and used for equilibrium m.c.'s < 12%.

### 836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

2399. MENON, P. K. B., and BURGESS, H. J. *Malayan timbers for furniture. Trade Leaflet, Malay. For. Serv.* No. 30, 1957. pp. 10. Price 1s. 3d.

Gives tabulated data on 33 Malayan species, with some Australian, British and U.S. species for comparison, and notes on availability by J. Wyatt-Smith. [Cf. *F.A.* 19 No. 1045.]

### 838. Vehicles (including Ships, Boats, Aircraft)

See also Nos. 2231, 2419.

2400. All-wood mine-sweepers. *Wood* 22 (9), 1957 (364-5).

Describes, with a sectional drawing, the construction of minesweepers in laminated Rock Elm [*Ulmus thomasi*] and Mahogany.

### 839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 2219, 2374, 2499, 2500, 2504, 2510.

2401. TODD, A. S., and ANDERSON, W. C. An appraisal of methods for salvaging small-sawmill residues in the Southeast. *Sta. Pap. Stheast. For. Exp. Sta.* No. 84, 1957. pp. 37. 2 refs.

Presents cost analyses for 10 possible methods, estimating, per volume of output, the cost of various component operations such as barking, chipping, handling and transporting, at the sawmill, the pulp-mill, or at concentration yards, and showing which is the best combination for a given volume under various conditions. *From authors' summary.*

### 84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyards Practice

#### 841. Wood Preservation

See also Nos. 1787, 1789, 2219, 2443, 2450, 2456-8.

2402. BAVENDAMM, W. Querschnitt durch die Holzschutzprobleme der Gegenwart. [Topical wood-preservation problems.] *Holz-Zbl.* 83 (136), 1957 (1655-6). [G.]

Summarizes papers read at the 5th Wood Preservation Conference at Munich, Oct. 1957: (1) Wood-destroying animals and wood preservation in

sea water (*G. Becker*), and Wood-destroying fungi in sea water (*S. Kohlmeier*). These papers report on recent research into the symbiosis of *Limnoria* and Teredinidae with marine fungi. It was found that *Limnoria* are unable to digest native, long-chain cellulose, but depend for their food on Ascomycetes and *Fungi Imperfecti* that break down the cellulose. Where these were not present, *Limnoria* could neither attack wood nor live on it. By destroying or roughening the surface, the *Limnoria* facilitate the entry of the fungi into the wood and help to spread them by endozoic spore dispersal. Both the capacity of teredinid larvae to attach themselves and the development of young adults appear also to depend largely on marine fungi and other micro-organisms. The fungi attack the wood in a manner resembling that of the soft-rot fungi, breaking down, in the first place the un lignified layers of the cell wall, the hyphae growing inside the cell walls in the direction of the cellulose fibrils. [Cf. *F.A.* 19 No. 2447.] (2) Other papers included: The susceptibility to poison of strains of wood-destroying fungi (*M. Gersonde*) and Comparison of strains of *Lentinus lepideus* (*G. Schultz*), both stressing the existence of strains exceeding in tolerance those commonly used in testing. Preservation of building timber with [Springer] pressure pumps (*W. Bavendamm*). Paper chromatography and analysis of [chiefly organic] wood preservatives (*H. H. Dietrichs*). Investigations of old wood and significance for wood preservation (*W. Sander mann*), in which certain timbers from Maya temples, which have withstood over 1000 years of a humid, tropical climate, are identified as *Achras sapota*.

2403. TAMBLYN, N. The importance of preservative treatments in hardwood utilization. Commonwealth Scientific and Industrial Research Organization, Melbourne. 1957. pp. 15. 19 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Preservative treatment should be regarded by the forester as an important aid in the utilization of round, sawn, and peeled hardwood timbers for many exterior and some interior uses. With sawn timbers for outdoor construction, a special problem may arise, owing to difficulty in penetrating the heartwood with preservatives and to the frequent need for a dual-purpose treatment to retard both mechanical and biological failure. Treatment with preservative oils at high pressures up to 1000 lb./sq. in., with or without incising, at present appears to offer the most practicable answer. For round timbers such as transmission poles, it is becoming increasingly recognized that preservative treatment is desirable even for durable species, as the sapwood must otherwise be disregarded in strength calculations, with the result that unnecessarily heavy sizes are used. Less durable pole timbers treated by conventional pressure methods should thus become fully competitive with durable species. To permit economical use of preservative at high retentions it is desirable that the sapwood volume should not be excessive.

Where preservation of sawn building timbers is considered necessary, cheap diffusion treatments of

green timber should be given first consideration so that costs may be kept to a minimum. In utilizing rain-forest hardwoods with a wide band of *Lyctus*-susceptible sapwood, fixed preservatives are usually unnecessary for interior building timbers. In this case permanent protection against borers can be obtained by cheap treatments of green or semi-green material with boron compounds. Where a general-purpose preservative is required for timber not subject to undue leaching the borofluoride-chrome-arsenic diffusion formula recently developed by the Division of Forest Products, C.S.I.R.O., Melbourne, offers considerable advantages. Its simple use by cold momentary dipping of the green timber followed by block stacking to permit diffusion, offers a cheap and attractive alternative to pressure treatment, particularly as both heartwood and sapwood can be penetrated. For preservative treatment of plywood, the momentary dip process for green veneer developed in Australia, is usually preferable and far cheaper than other methods. Any timber species may be treated with almost any water-borne preservative that does not affect subsequent gluing of the plywood. *From author's summary.*

2404. [Timber preservation authority decision.] *N.Z. Timb. J.* 4 (1), 1957 (49, 51).

Gives approved New Zealand standards for pressure treatments (with Boliden S25, Tanalith U and C, Celcure, boron, creosote, and PCP) and for diffusion treatments (boron, Osmosar, and Tanalith D).

2405. PUTMAN, R. B. How and what to specify in the preservative treatment of wood for buildings. *For. Prod. J.* 7 (10), 1957 (360-2).

Contains a list of specifications for preservatives and solvents by the American Wood Preservers' Association and the Federal Supply Service, standard retentions specified by these bodies, and practical recommendations as to the most suitable treatments to specify for foundations, parts of dwelling houses, industrial buildings etc.

2406. Liste des produits homologués au 1er juin 1957. [List of approved products [wood preservatives] as on June 1, 1957.] Centre Technique du Bois, Paris, and Centre Technique Forestier Tropical, Nogent-sur-Marne. [1957]. pp. 29. [F.] P.R.

A list of preservatives (commercial name, characteristics mentioned in the approval, prescribed concentration, method of use, remarks, and manufacturing firm) for logs, freshly converted timber, and timber in use, approved by these two centres, with some terms and definitions.

2407. STUMPP, K. Garantie für Holzschutzmittel. [Guarantee for wood preservatives.] *Holz-Zbl.* 83 (134), 1957 (1626). [G.]

A discussion of the problems involved in predicting the effect of treatments in practice, particularly in building. While present chemical, physical and biological tests allow predictions under well defined conditions, their practical application and control is often difficult or impossible, especially where the principle of accepting the lowest tender is observed.

2408. NOWAK, A. Untersuchungen über die fungizide Wirkung einzelner Bestandteile verschiedener Steinkohlenteeröle. [Investigations on the fungicidal effect of the constituents of different creosotes.] *Holz Roh- u. Werkstoff* 14 (7), 1956 (268-70). 8 refs. [G.g.] P.R.

Results of tests (DIN 52, 176) on the fungicidal effect of 3 creosotes containing respectively 2.5, 4 and 9% of acid oils (phenols), showed that: (1) a loading of ca. 26 kg./cu.m. provided complete protection against *Coniophora cerebella*, regardless of the phenol content; (2) the corresponding figure for *Lentinus squamosus* was 70 kg.; (3) the proportion of acid constituents has practically no fungicidal effect. The separation of phenols from creosote, would, however, be uneconomic and probably reduce the wetting properties of the creosote.

2409. ANS, A. M. D', and SCHULZE, B. Elektronen-mikroskopische Untersuchungen an imprägnierten Hölzern. [Electron-microscope studies of impregnated woods.] *Holz Roh- u. Werkstoff* 14 (7), 1956 (252-6). 4 refs. [G.g.] P.R.

Electron-microscope studies of the deposition of fluorides and  $\text{HgCl}_2$  in wood showed that: the particles that crystallize in wood from the impregnating solutions can be viewed and measured; their density decreases from the surface toward the centre of the impregnated zone; they are discernible even outside the boundary of the Zr-alizarin reaction; they are smaller in moist than in dry wood; the depth of penetration is less in dry than in moist, and less in early than in late wood; and  $\text{HgCl}_2$  crystallizes in particles of two different sizes.

2410. SCHULZ, W. O., and SIPPEL, E. Über die Beeinflussbarkeit der im Holz vor sich gehenden Fixierung von U- und UA-Salzen durch Säurezusätze. [On the possibility of effecting the fixation of U and UA salts in wood by the addition of acids.] *Holz Roh- u. Werkstoff* 14 (7), 1956 (257-67). 12 refs. [G.g.] P.R.

Presents the results of tests carried out with UA salts (type Tanalith UB) without F, UA salts with F, and U salts (Triolith U) without As. Standard Scots Pine sapwood blocks (DIN 52,176) were impregnated with 4% solutions, subjected to leaching, and the amounts of leached Cr, F and As determined. The reduction of dichromate and fixation of As in all non-acidified mixtures required a period of 2-3 months. The rate of fixation could be controlled by varying the amount of the acid added. Optimum fixation rates were obtained by adding an amount corresponding roughly to the theoretical amount calculated from the assumption that As fixation consists in the formation of the trichromium arsenate and F fixation in that of chromium cryolith. The fixation of As can be reduced to ca. 4 days; an excess of acid again lengthens the period of fixation. Fixation of F depends not only on the proportion of acid, but also on the Na and K content in the preservative mixture. Different Na/K ratios, or replacement of Na by  $\text{NH}_4$ , produce great changes in the leachability of F.



2411. NARAYANAMURTI, D., and VERMA, G. Über die Beständigkeit wasserlöslicher Holzschutzmittel vom 'U-Typus' gegen Auslaugung. [The leaching resistance of 'fixed-type' water-soluble wood preservatives.] *Holz Roh- u. Werkstoff* 14 (9), 1956 (332-8). 3 refs. [G.g.] P.R.

Presents the results of extraction tests on 9 common Indian wood species, impregnated with different water-soluble preservatives. The extractants used were: water, acetic acid, citric acid,  $H_2SO_4$ , acidified peptone, peptone used for 15 days as medium for *Polystictus sanguineus*, and water used for leaching wood attacked by this fungus.

2412. COOK, C. D. Permanence of water-borne preservatives in timber. *Chem. & Ind.* 1957 (21), (663). 3 refs. P.R.

The 'fixed' Cu-Cr-As preservatives can be significantly leached only when the pH of the water flowing past the treated timber is  $< 3.0$ .

2413. Richtlinien für die Lieferung und Anwendung von Dikrozit-P als wasserlösliches Holzkonservierungsmittel. Richtlinien für die Tränkung von Holz nach dem Kesseldruckverfahren mit wässriger Dikrozit-P-Lösung. [Instructions for the supply and application of 'Dichrosite P' as a water-soluble wood preservative. Instructions for impregnation of wood with aqueous solution of 'Dichrosite P' by the vacuum-pressure method.] *Bulletin, Institut de l'Europe Occidentale pour l'Imprégnation du Bois, Den Haag* No. 5, 1956. pp. 12. [G.] Also available in French edition. P.R.

Describes the subject of Austrian patent No. 177,559.

2414. JONAS, G.-Z. Der Einfluss verschiedener Faktoren auf die Reduktion von Kalium-Bichromat im Holz. [Effect of various factors on the reduction of  $K_2Cr_2O_7$  in wood.] *Holz Roh- u. Werkstoff* 14 (10), 1956 (403-7). 22 refs. [G.g.] P.R.

Results of experiments showed that the following factors influence the reduction process: (1) Concentration of the solution: the higher the concentration the greater the reducing capacity of the wood. (2) Time: the reducing capacity increases as the time of action increases. (3) Moisture content: optimum effect at low m.c., but no distinct relationship for the range 0-13% m.c. (4) Temperature: the reducing capacity increases as the temperature rises. (5) pH: the reducing capacity decreases as pH increases.

2415. ZYCHA, H., and HÄRTEL, W. Zur Frage der Holzimprägnierung mit Kupfersulfat. [Wood preservation with  $CuSO_4$ .] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 86, 1956 (49-63). 13 refs. [G.g.]

Tests by standard methods confirmed great differences in effectiveness against different fungi. After a period of leaching, even original dosages of 100 kg.  $CuSO_4$ /cu.m. were insufficient against *Poria vaporaria*. Residual values after leaching were between 2.5 and 3.5 kg./cu.m. independent of original concentration (if  $> 0.5\%$ ) and, contrary to widely held views, of methods of drying.

2416. KÖRTING, A. Über die quantitative Fluorbestimmung im Holz als Bewertungsmöglichkeit für praktische Holzschutzmassnahmen im Bauwesen. [Quantitative tests for fluorine in wood as a means of evaluating actual preservation treatments in buildings.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 86, 1956 (3-32). 12 refs. [G.g.]

Describes tests, using Schuch's method [cf. F.A. 15 No. 809], on Spruce and Pine samples painted with a BF<sub>3</sub> and an SF salt (chief components  $KHF_2$  and  $MgSiF_6$  respectively), 3-634 days after treatment, and similar tests on two roof structures that had been commercially treated with prescribed amounts (150 and 100 g./sq. m. surface). If the various factors tested—time, species, type of wood (heart- or sapwood) moisture content, position (horizontal, sloping, vertical) etc.—are taken into account, the method, though somewhat slow and expensive, is considered capable of giving some indication, within rather wide limits, of the amount of preservative originally applied.

2417. BURO, A., and BECKER, G. Der Einfluss von Wassergehalt, Eigenschaften und Veränderungen von Nadelhölzern auf die Diffusion von Natriumfluorid in der Zellwand. [Effect of moisture content and properties of, and changes in, coniferous woods on the diffusion of NaF in the cell wall.] *Holz Roh- u. Werkstoff* 14 (10), 1956 (388-403). 30 refs. [G.g.] P.R.

Results of experiments with Scots Pine, Spruce and Silver Fir wood at 100% relative humidity show that the relationships between depth of penetration and moisture content (m.c.) of wood can be represented mathematically by a straight regression line with a steep gradient. The diffusion of NaF began at m.c. 17-19%. The penetration ratios in axial, radial and tangential directions were  $1 : \frac{2}{3} : \frac{1}{2}$ . The diffusion rate does not seem to depend directly on ring width and density. Radial and tangential penetration into Pine reaction wood were respectively 19% or 15% less, than in normal sapwood. For the same m.c., penetration into heartwood (or ripewood) was 3% (Pine), 15% (Spruce) and 39% (Fir) less than into sapwood. Moderate resin content had no substantial effect on the rate of diffusion. Normal sapwood extracted with acetone did not show an increase of diffusion rate. The method of seasoning had no distinct effect on the penetration of NaF. When the cell lumina were filled with creosote or liquid paraffin, the mean rate of diffusion was reduced by 7-10% in the range of the fibre-saturation point. For NaF, the mean rate of diffusion decreased in the following sequence: P-h, P-s, F-r, S-r, S-s, F-s, where P, F and S are Scots Pine, Silver Fir and Spruce and h, s, and r are heartwood, sapwood and ripewood, respectively.

2418. [Effect of NaF on wood decay by *Coniophora cerebella*.] *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (33-5).

Results of tests show that the rate of decay increases with increasing concentration of fluoride up to 0.02%, while at 0.05% a toxic effect becomes evident.

2419. RICHARDSON, J. H., and OGILVY, W. S. **Antimicrobial penetrant-sealers.** *Applied Microbiology, Baltimore* 3 (5), 1955 (277-88). 16 refs. L.S.

In laboratory tests designed to discover surface treatments for masonry and/or wood sufficiently penetrant to resist wear, washing etc. and so prevent mould formation in meat-processing plants and equipment, various formulations containing Cunilate (Cu 8-quinolinolate) were found to be very effective. Of these, 1% Cunilate 2174 in deodorized mineral spirits, 1% emulsified Cunilate 2419, Cunilate varnish and Cunilate raw linseed oil were tried successfully under severe service conditions in trucks and lorries, including wooden floors etc. [Cf. *F.A.* 18 No. 4674.]

2420. YEARSLEY, M. G. **Final report on trials of copper naphthenates and mercuric naphthenates as wood preservatives.** *Emp. For. Rev.* 36 (3), 1957 (287-91). 2 refs. [Cf. *F.A.* 19 No. 1063.]

2421. ZYCHA, H., and HERBOLD, F. Die Schutzsalzaufnahme von Fichten-Masten bei der Tränkung im Saftverdrängungsverfahren. [Salt absorption by Spruce poles impregnated by sap-displacement processes.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 86, 1956 (33-48). 8 refs. [G.g.]

Describes quantitative tests on 18 Spruce poles of ca. 22 cm. mid-diameter, impregnated with a 1.5% UA salt solution by Gewecke's 'trough-suction' process, in which freshly cut and barked poles are placed in a trough and provided with suction caps on their transverse ends, the trough is then filled with preservative and the caps connected with a pump providing a slight vacuum (650-700 mm. mercury). In cross-section, only 37% (69% of the sapwood) was found to be impregnated, with little difference between the ends and the middle of the stem. Actual quantities per cu.m. of impregnated zone were ca. 80-90% of the maximum possible computed on the basis of available pore space, and considerably short of the amounts per total cubic content usually assumed and stipulated, the first, it is thought, because of the presence of air in the sapwood, particularly in its inner layers, and the latter because differences in proportions of sapwood in poles of different diameter have not been taken sufficiently into account, even assuming their total impregnation by improved techniques. Similar results were obtained with poles treated by the original Boucherie process.

2422. Über die Lebensdauer von hölzernen Leitungsmasten. [Service life of wooden transmission poles.] Institut de l'Europe Occidentale pour l'Imprégnation du Bois, Den Haag. 1955. pp. 19. [G.] X.

Summarizes results of a questionnaire (64 firms in 14 countries) giving details on wood species, method of impregnation used, nominal uptake, after-treatment, and service life with and without after-treatment.

2423. WHITE, N. **How would you handle 50,000 poles a year?** *Aust. Timb. J.* 23 (8), 1957 (50...59, 123).

Describes in detail the overhead travelling crane

and creosote pressure-impregnation system of Saxton Timber and Trading Ltd., Melbourne, reputed the largest in Australia. It supplies transmission poles and cross-arms of 8 species of Eucalypt. The expected life of the poles is > 30-35 years and the expected superior strength of treated poles (under test) may allow of the reduction of present standard dimensions.

2424. **Pressure treated timber poles.** American Wood Preservers Institute, Chicago. 1957. pp. 74. P.R.

Illustrated description of numerous uses of pressure-treated poles; also data on design of outdoor hoardings and pole buildings.

2425. LUMSDEN, G. Q. **Wood poles for communication lines.** *Bull. Amer. Soc. Test. Mater.* No. 222, 1957 (19-24). 19 refs. P.R.

Discusses the merits of wooden poles, presents in a graph the proportions of various species and of preserved poles used by the Bell system and suggests various improvements in poles, viz. before, during, and after, treatment.

2426. **Cooling tower preservation.** *Plant Engineering, Chicago* 9 (12), 1955 (112-3). L.S.

Short-term results from a double-diffusion process, originally developed and successfully used for fence-posts [see *F.A.* 3 p. 322; 15 No. 2968] and now applied to cooling towers, are promising. The whole of the inside of the tower is sprayed with a slurry of  $\text{CuSO}_4$  and some days later with one of  $\text{Na}_2\text{CrO}_4$ , which reacts with the  $\text{CuSO}_4$  to give a precipitate of Cu chromate.

2427. BÖMEKE, H. Der Einfluss imprägnierten Holzes auf Äpfel. [The effect of impregnated wood on apples.] *Mitt. biol. Bundesanst. Land- u. Forstw., Berl.* No. 85, 1956 (164-5). [G.]

Describes preliminary experiments to test preservatives suitable for trays etc. used in the storage of apples, as some preparations have been found to promote decay of the fruit. Odourless U-salts proved most suitable, though probably not all would be so. The damaging effect was found to diminish with time.

2428. COWLING, E. B. **The relative preservative tolerances of 18 wood-destroying fungi.** *For. Prod. J.* 7 (10), 1957 (355-9). 8 refs.

Killing points (in lb./cu. ft.) are tabulated for 10 preservatives of present or potential importance: 14 of the fungi showed striking tolerance to one or more of the substances tested, combined with marked susceptibility to one or more of the others. *Fomes subroseus* is considered a suitable test organism. A rapid modified agar-block test procedure is described. From author's summary.

2429. SHIBAMOTO, T., and SHOJI, R. [Studies on the standard evaluating method for preservative-treated wood (preliminary report)—on the testing method for evaluating wood preservative.] *Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (99-112). 11 refs. [Jap.jap.e.e.]

Details a proposed standard using *Poria vaporaria*



(cultured on Beech sapwood dust), Beech sapwood pieces, vacuum/pressure impregnation and weathering (by heat treatment and leaching). The method of inoculation and the presentation of results are described, examples of the latter being tabulated for preservatives.

2430. LUND, A. E. **An accelerated wood-preserved termite study.** *For. Prod. J.* 7 (10), 1957 (363-7). 14 refs.

Describes laboratory tests with 40 samples of Southern Yellow Pine sapwood treated with various dosages of (a) Tanalith, (b) Boliden salt, and (c) copperized chlorated  $ZnCl_2$ , and buried in moist soil in jars containing termites of the genus *Reticulitermes*. Of blocks treated with (a) and (b) only one that had received the weakest dose, 0.062 lb./cu. ft., showed signs of attack. Of (c) blocks, only those that had received 1 lb./cu. ft. showed no signs.

#### 842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

2431. RISI, J., and ARSENEAU, D. F. **Dimensional stabilization of wood. Part III. Butylation.** *For. Prod. J.* 7 (8), 1957 (261-5). 13 refs.

Describes experiments with *n*- and *t*-butylation of Balsam Fir wafers, the effect of heating time, reaction temperature, composition of treating solution etc., and humidity studies on treated wood. Both treatments impart temporary stability only and are likely to impair strength owing to the permanently damp condition of the treated wood at the usual relative humidities; though comparatively cheap, they are not considered of practical value. [Cf. *F.A.* 19 Nos. 1077-8.]

2432. RISI, J., and ARSENEAU, D. F. **Dimensional stabilization of wood. Part IV. Allylation.** *For. Prod. J.* 7 (9), 1957 (293-5). 7 refs.

Describes experimental methods using allyl chloride with or without catalyst, and with or without pressure, on wafers of Balsam Fir or *Betula lutea*. Allylation did not produce a bulking effect but reduced hygroscopicity. It is hoped that by a careful control of conditions, the degradation effects (loss of weight and dimensions) observed with increasing temperatures or treating times may be minimized and the treatment have commercial possibilities. It is simple and the product is stable in water and of a good colour. [Cf. *F.A.* 19 Nos. 1077-8.]

2433. SEBORG, R. M., and TARKOW, H. **Effect of storage on phenolic resins and their ability to stabilize wood dimensions.** *For. Prod. J.* 7 (8), 1957 (256-61). 3 refs.

Storage life of phenolic resins and their aqueous solutions, i.e. the degree of polymerization or other changes affecting their use in the manufacture of 'impreg', varied considerably for temperatures between 63° and 90° F. Miscibility of resins was about the same whether resins were diluted before or after storage. Tests with Honduras Mahogany and Yellow Birch showed that the loss in stabilizing effectiveness for solutions which were aged but still miscible with water, was only 6%. Tests of highly

polymerized resins diluted with weak alcohol suggested that the amount of resin deposited in the cell wall (on which stabilization depends) decreases with increasing polymerization.

2434. GURVITCH, J. E. **The past developments and future prospects for Compreg.** *For. Prod. J.* 7 (9), 1957 (16A-17A).

Traces the development in the U.S.A. of this resin-impregnated densified wood widely used during the war for propellers etc. [cf. *F.A.* 8 No. 1312], its decline, and recent revival for old and new uses, including moulded articles (knife handles, loom and furniture parts). Developments outside the U.S.A. include the successful use of Pine plywood for its manufacture in Russia, and the use of cresols in place of phenols in most European material, resulting in greater toughness and leading to its extensive use in the electrical, chemical, and transport industries.

#### 844. Attack by Plant Organisms

See also Nos. 2218-9, 2242.

##### 844.1. Sap-staining and Mould Fungi

See No. 2465.

##### 844.2. Wood-destroying Fungi

See also Nos. 1937-50, 2304, 2402, 2408, 2415, 2417-8, 2428-9, 2458.

2435. COWLING, E. B. **A partial list of fungi associated with decay of wood products in the United States.** *Plant Dis. Repr.* 41 (10), 1957 (894-6). A.P.B.

2436. GADD, O. **Wood decay resulting from rot fungi.** *Pap. ja Puu* 39 (8), 1957 (363...374). 23 refs. [E.e.fi.] P.R.

Discusses present knowledge of the chemistry of decaying wood and gives a table showing the tolerance of micro-organisms to various aromatic compounds. Investigations of the reaction of the phenolase enzymes of rots attacking both carbohydrates and lignin suggested that their main function is the polymerization and oxidation of aromatic compounds from the lignin which are toxic to the fungi, converting vanillin to catechol and guaiacol to tetraguaiac-quinone. An investigation of Spruce attacked by *Fomes annosus* showed that guaiacol, tetraguaiac-quinone and catechol originated from the lignin. Formulae for the reactions are presented.

2437. BUTLER, G. M. **The development and behaviour of mycelial strands in *Merulius lacrymans* (Wulf.) Fr. I. Strand development during growth from a food-base through a non-nutrient medium.** *Ann. Bot.* 21 (84), 1957 (523-37). 17 refs. O.R.E.

Strand development from a wood food-base over a moist non-nutrient medium (generally small flower-pot fragments) was studied in glass tubes. Strand initials formed behind the mycelial margin in the first 2-3 weeks after its development. New growth in the older parts of the mycelium consisted chiefly of an increase in thickness of strand initials. There was no visible maturation. Rate of strand

formation remained constant with increasing distance from food source, but altering the latter's size or distance affected density of mycelium and strands more than the growth rate of individual hyphae of the mycelial margin. When the inoculum was removed and no fresh food supply introduced, the growth rate of the mycelial margin fell abruptly and ceased almost entirely within the first week. All strand development also ceased, and the mycelium became moribund.

2438. TOUZÉ-SOULET, J. M., and MONTANT, C. Les acides organiques de quelques basidiomycètes supérieurs. [The organic acids of some higher basidiomycetes.] *C.R. Acad. Sci., Paris* 245 (21), 1957 (1825-8). 12 refs. [F.] O.R.S.

Lists the acids identified by chromatography in *Polyporus sulphureus*, *Coriolus versicolor*, *C. hirsutus*, *Xanthochrous hispidus* and *Lenzites quercina*.

2439. BUSHNELL, W. R. Acidic metabolic products of *Polyporus sulphureus*. *Mycologia* 49 (5), 1957 (623-35). 16 refs. P.R.

The rate of acid synthesis when the fungus was cultivated on liquid media was investigated. Acetic acid was found to be the main component of the ether-soluble material; other acids were: oxalic, malic, fumaric, succinic and citric.

2440. Soft rot investigations. *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (32-3).

Under the conventional conditions of nutrition, the weight of surface growths of fruiting bodies of *Chaetomium globosum* is directly proportional to the weight lost by the wood in laboratory tests.

2441. ETHERIDGE, D. E. A method for the study of decay resistance in wood under controlled moisture conditions. *Repr. from Canad. J. Bot.* 35, 1957 (615-8). 3 refs.

To minimize any influence on the decay which might result from inoculating, oven-drying or sterilizing test blocks, techniques adopted were: (1) oven-drying only one block from each sample, and sterilizing the surface with propylene oxide gas; (2) inoculating the blocks with pieces of infected wood. The m.c. is expressed as a % of the moisture present at fibre saturation point rather than as a % of oven-dry weight, as this eliminates some of the m.c. variations due to differences in sp. gr.

2442. HUGHES, J. F. The procedure used at the research unit of the Utilization Division, Forest Department, Tanganyika, to determine the natural durability of local timbers in contact with the ground. (Project No. 3.) *Tech. Note Util. Div. For. Dep., Tanganyika* No. 4, 1957. pp. 13.

2443. HUGHES, J. F. The procedure used at the research unit of the Utilization Division, Forest Department, to ascertain the relative durability of treated timbers in contact with the ground. *Tech. Note Util. Div. For. Dep. Tanganyika* No. 5, 1957. pp. 9.

2444. BORLANDO, L. A. Determinación de la durabilidad natural de algunas maderas argentinas. [The natural durability of some Argentine woods.] [Publication] *Laboratorio de Ensayo de Materiales e*

*Investigaciones Tecnológicas, La Plata* (Ser. 2) No. 51, 1953. pp. 23. 19 refs. [Span.span.e.]

Specimens of *Calycophyllum multiflorum*, *Phyllostylon rhamnoides*, *Libocedrus chilensis*, *Aspidosperma blanco* and *Schinopsis lorentzii* (the last named of known durability and included for purposes of comparison) were tested by exposure to different species of decay fungi, by (1) Alliot's method [cf. *F.A.* 7 No. 1920] and (2) the Leutritz method [see *F.A.* 9 No. 2272]. Only *L. chilensis* showed a natural durability comparable with that of *S. lorentzii*. The remaining species are unsuitable for use in sites exposed to decay.

2445. BORLANDO, L. A. Durabilidad natural relativa del duramen de varias maderas argentinas. [Natural durability of the heartwood of various Argentine timbers.] [Publication] *Laboratorio de Ensayo de Materiales e Investigaciones Tecnológicas, La Plata* (Ser. 2) No. 68, 1956. pp. 13. 15 refs. [Span.span.e.]

Presents the results of laboratory tests on 24 native woods, classified for natural durability according to Findlay's system. The two most durable woods are *Astronium balansae* and *A. urundeuva* (very resistant) followed by *Schinopsis lorentzii*, *Prosopis caldenia*, *Libocedrus chilensis*, *Piptadenia macrocarpa* and *Caesalpinia macrocarpa* (resistant).

2446. HOSSFELD, R. L., OBERG, J. C., and FRENCH, D. W. The appearance and decay resistance of discoloured Aspen. *For. Prod. J.* 7 (10), 1957 (378-82). 3 refs.

Observations in fence-post trials and soil-block decay tests indicate that discoloured woods associated with knots, *Nectria* canker, and 'wetwood' were more resistant to decay than ordinary sapwood. Alcohol extracts from fluorescent wood were more toxic towards test fungi than those from non-fluorescent wood. [Cf. *F.A.* 18 No. 1108.]

2447. MEYERS, S. P., and REYNOLDS, E. S. Incidence of marine fungi in relation to borer attack. *Science* 126 (3280), 1957 (969). 4 refs. O.R.S.

Studies, mainly on Southern Yellow Pine and Basswood, showed that fungal infestation occurred in all test areas (boreal, north-temperate and sub-tropical); *Lulworthia* and *Helicoma* spp. were very abundant, colonizing wood at most stations. Vigorous attack on submerged wood in boreal and north-temperate areas during winter was accompanied by little or no borer attack. In subtropical areas a similar situation occurred but with a considerably shorter period of fungal attack before borer infestation. The outer wood tissues were disintegrated, often to a depth of several millimetres, hyphae proliferated throughout the wood, and there was direct penetration through element walls. Study of the inter-relationship of borer and fungal activity is being continued. [Cf. *F.A.* 19 No. 2402.]

#### 845. Attack by Animals

##### 845.1. Marine Borers

See also Nos. 2402, 2447.

2448. NAIR, N. B., and GURUMANI, O. N. Timber boring molluscs of the Indian Coast. I. Report



on a collection from Tondi and Adirampatnam, East Coast. *J. Bombay nat. Hist. Soc.* 54 (3), 1957 (663-73). 10 refs. O.R.S.

Descriptions of 2 species of *Bankia* and 6 of *Teredo*, with notes on occurrence and distribution.

2449. NAIR, N. B. The shipworms of South India with a note on the breeding season of *Bankia indica* Nair. *J. Bombay nat. Hist. Soc.* 54 (2), 1957 (344-57 + 1 plate). 32 refs. O.R.S.

2450. BECKER, G. The poisonous action of inorganic salts,  $\alpha$ -chloronaphthalene and contact insecticides on the gribble *Limnoria*. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3357, [1957?]. pp. 12 + 4 photos. 28 refs. Transl. by H. Fessler from *Holz Roh- u. Werkstoff* 13 (12), 1955 (457-61). [See *F.A.* 18 No. 2230.] Limited distribution. P.R.

#### 845.2. Terrestrial Borers

See also Nos. 1270, 2063-4, 2072-3, 2218-9, 2288.

2451. PALM, T. Virkesförförande insekten i järnvägssystrar på Böda kronopark. [Wood-destroying insects in railway sleepers in Böda state forest [Öland].] *Entomologisk Tidskrift, Stockholm* 77 (2/4), 1956 (158-63). [Sw.g.] O.R.S.

As a result of insect damage, untreated Pine sleepers have a service life of 7 years or less on sandy soils in the N. of the island. Insects causing most damage are *Buprestis octoguttatus* and *B. rustica*, followed by *Leptura rubra* and *L. sanguinolenta*.

2452. RASMUSSEN, S. Simultaneous analysis of several growth factors in *Hylotrupes* larvae. *Oikos* 8 (1), 1957 (65-81). 12 refs. [E.]

Deals mainly with the use of complicated designs in this kind of work, making it possible to examine the effects of several factors simultaneously.

2453. FOUGEROUSSE. Les piqûres des grumes de coupe fraîche en Afrique tropicale. [Worm-holes in freshly cut logs in French West Africa.] *Bois For. Trop.* No. 55, 1957 (39-52). [F.e.span.]

Describes the various types of borer involved and their identification, and what is known and surmised of the phenomena of attraction; analyses the factors that determine the time of onset and severity of attacks; and makes some suggestions for protection.

2454. Project I. The incidence and degree of intensity of ambrosia beetle attack in relation to the time factor, climate, and condition of the timber. *Rep. W. Afr. Timb. Borer Res. Unit 1953/55*, 1957 (13-8).

Describes investigations, already briefly reported [see *F.A.* 18 No. 3458], over the period Sept. 1953 to Jan. 1955 in Ashanti, Gold Coast. *Antiaris africana* and *Albizia* spp. were selected as host species. Ambrosia-beetle attack begins within 24 hours of felling. Barking is conducive to attack, the effect decreasing with time after felling, until, after 20 weeks, logs with and without bark are equally infested. Since buprestid and longhorn beetles need bark for egg-laying and larval development, barking 3 weeks after felling is recommended; this would

destroy larvae of longhorn beetles without making logs significantly more attractive to ambrosia beetles. Attack was significantly lower in logs raised off the ground than in those on it; cross-wise stacking is recommended. Seasonal variations are small, and density of attack bears no relation to rainfall or temperature, log girth, the exposed or shaded nature of the site, or position on the log surface.

2455. Project II. The relative susceptibility of different timber species to ambrosia beetle attack. *Rep. W. Afr. Timb. Borer Res. Unit 1953/55*, 1957 (19-28 + 1 photo).

Results of studies on billets 2 ft. long from 20 tree species are tabulated. None was immune from attack and most were severely attacked. Both round and cross-cut surfaces were affected. The peak of infestation developed in the first 3 weeks after felling. Beetles showed a marked preference for barked billets; Scolytidae preferred small-girthed and Platypodidae large-girthed ones. No relation was discovered between density of attack and bark thickness, wood density, moisture content, starch content, or botanical grouping of the 20 species.

2456. Project III. Chemical protection of logs against attack by ambrosia beetles. *Rep. W. Afr. Timb. Borer Res. Unit 1953/55*, 1957 (29-30).

Nine trees of *Triplochiton scleroxylon* were felled and sprayed. Of the 9 chemical treatments tested, BHC water emulsion plus Ceremul M, and BHC solution in fuel oil gave excellent protection, and all treatments, except Ceremul M alone, good protection. Beetle populations were, however, too low for definite conclusions to be drawn.

2457. [Protection of logs from shot- and pin-hole borers.] *Rep. For. Dep. N. Borneo 1956*, [1957] (18).

A small trial of 5 proprietary insecticides was carried out on logs of *Parashorea malaanonan*. It was found that beetle attack was far more severe on barked than on unbarked logs, and > 10 times as severe on logs left in the shade as on those in the sun. Effective control was obtained for > 6 weeks on both barked and unbarked logs with two proprietary insecticides [unnamed] applied as a water-based spray.

2458. YAZAWA, K., HIGUCHI, T., and MACHII, S. [A study on Buna [*Fagus crenata*] timber in Nagoya Forest Bureau district. Preliminary experiments on fungal and insect protection in the forest and on a cause of star-shaped false heartwood in Buna.] *Report, Nagoya Forestry Bureau No. 5*, 1957. pp. 56. 7 refs. [Jap.]

Unbarked logs 4 ft. long and of 6 in. mean diam. were laid on the floor at regular intervals in natural or cleared openings in the Beech forest, in a sunny, windy area (A) and in a more sheltered one (B). Of the 28 logs in each, some were sprayed as soon as converted and laid down (June 14), and again on June 29, others left unsprayed. Six chemicals were used, Pentamine, PCP/BHC mixture, Bunazol [not further specified], Creosol No. 3, Nitrorodan N<sub>1</sub>, and N<sub>2</sub> (esters), all at 1/3 dilutions with oil at ½ litre/koku of log. A third lot of 19 logs (C) was stacked and

sprinkled continuously with water. All 3 lots were minutely examined every 10 days for fungal and insect attack, and moisture content (m.c.), until Sept. 21, when they were converted into planks and disks.

As regard fungi, (A) and (B), whether sprayed or not, remained externally fresh, shedding no bark, but unsprayed (A) (m.c. 74.5%) showed 39% discoloration or decay, and unsprayed (B) (m.c. 87%) only 13.2%. M.c. and decay were highly correlated. In both plots spraying largely prevented decay but not discoloration (19–50.5%), PCP being the most effective, Creosol and Nitrorodan N<sub>2</sub> least. (C), sprinkled, were neither discolored nor decayed; (C), unsprinkled, showed 32.2% discolored or decayed. As regards insects, Pentamine gave good protection in (B) but not in (A), Creosol was least effective, all others were good. In (C), sprinkling gave complete protection, whereas the unsprinkled logs averaged 176 boreholes/sq. m. surface by September.

Data are presented in tables and graphs. 14 species of borer were identified, viz. 5 *Xyleborus*, 4 *Scolytoplatypus*, 4 *Platypus*, 1 *Crossotarsus*. The author adduces evidence pointing to *C. niponicus* as the cause of star-shaped false heart in some of these logs.

#### 845.3. Termites

See also No. 2430.

2459. GAY, F. J., *et al.* The development and use of field testing techniques with termites in Australia. *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 280, 1957. pp. 31 + 5 photos. 17 refs.

Includes chapters on development of methods of testing near mound colonies, procedure for field testing near mound colonies, tests with non-mound-building species, testing method for wallboards, plywood etc., and technique for assessing the efficacy of soil treatments.

2460. EBELING, W., and PENCE, R. J. Relation of particle size to the penetration of subterranean termites through barriers of sand or cinders. *J. econ. Ent.* 50 (5), 1957 (690–2). 1 ref.

Experiments with these termites, e.g. *Reticulitermes hesperus*, show that they can, but are reluctant to, burrow from sand of a certain particle size into another of larger size. Sands allowing > 5% of particles to be retained on the 10-mesh screen and > 5% to pass the 16-mesh, form an impassable barrier. The smaller particles are too large to be pushed aside or carried, the larger not large enough to leave negotiable interspaces. Wider ranges of particle size, particularly extensions on the larger side, e.g. 6- to 16-mesh sand, are equally impassable if tamped. Crushed volcanic cinders (30% lighter than sand) are also impassable. These observations are now under test for protecting house foundations. Insecticide-treated asphalt is also being tested as a termite barrier.

2461. WICHMANN, H. E. Unbekannte Wege der Termiten-Einschleppung. [Unfamiliar ways of importing termites.] *Anz. Schädlingsk.* 30 (11), 1957 (183–5). 14 refs. [G.g.]

Cites instances of the introduction into Germany of termites, viz. *Zootermopsis angusticollis* and *Reticulitermes flavipes*, in imported wood, and quotes some facts pointing to the possibility of these pests (especially the latter) becoming established.

2462. SCHMIDT, H. Die Termitenfrassschäden in Hamburg-Altona. [Damage by termites in Hamburg-Altona.] *Holz Roh- u. Werkstoff* 14 (9), 1956 (325–8). 10 refs. [G.g.] P.R.

Describes the damage done in the 'termite area' of Hamburg-Altona by the imported *Reticulitermes*, and the preventive and control measures planned and effected.

#### 846. Steaming

2463. FILIP, V. Uși de beton armat pentru camerele de aburire. [The use of reinforced concrete for steaming chambers.] *Industr. Lemn.* 6 (9), 1957 (319–22). 2 refs. [Rum.russ.g.f.e.]

Four types of door were tested for wood-steaming chambers: (a) wooden, (b) solid reinforced concrete, (c) reinforced concrete with internal insulation, (d) reinforced concrete with breeze-block interior insulation. Analyses of heat loss, steam consumption and manufacturing cost indicated the superiority of (d).

#### 847. Drying (Seasoning)

See also Nos. 2219, 2286, 2291.

2464. PAVELESCU, I. M. Cîteva date asupra pierderilor lemnului de foioase fasonat în steri. [Some data on weight loss of stacked cordwood.] *Rev. Pădurilor* 1957 (9), (582–4). [Rum.rum.russ.g.f.e.]

Gives tabulated data for % loss of weight for Beech, Oak, Spruce and Alder cordwood, stacked green, (a) barked and (b) unbarked, in summer and winter, at 30, 60, 90, 150, and 180 days after stacking.

2465. PAGE, R. H., and CARTER, R. M. Heavy losses in air seasoning Georgia Pine and how to reduce them. *Sta. Pap. Stheast. For. Exp. Sta.* No. 85, 1957. pp. 20. 7 refs.

A general study of conditions in 20 yards, supplemented by more detailed investigations on the degrade of 4/4 boards stacked by one of 4 conventional methods: flat, package, end, or crib. Stain was the most serious factor, followed by warping. Recommendations on the construction of foundations, covering, spacing, aligning and size of stickers etc., and on anti-stain dipping are given.

2466. Modern techniques for the drying and conditioning of timber. Organization for European Economic Co-operation, Paris. 1957. pp. 144.

Reports of a mission to the U.S.A. to study seasoning practice and current research. There are sections on the mechanical handling of timber, concentration yards and electrical moisture meters, and an 11-page bibliography.

2467. Redwood seasoning reports. California Redwood Association, San Francisco. 1957. pp. 94. P.R.

A loose-leaf cover with 26 reports published since



1950, referring to the seasoning, storage, shipping, and transport of *Sequoia sempervirens*, also to problems of weathering and corrosion of fastenings.

2468. **Effect of air speed on drying rate.** *Rep. For. Prod. Res. Bd., Lond.* 1956, 1957 (12).

Tests have shown that the air volume, as well as the speed of the air flow, is of importance in drying. Increase of air speed reduces the time for drying by one-way circulation, the effect being much less pronounced when the circulation is reversed at 15-min. intervals.

2469. GUERNSEY, F. W. **High-temperature drying of British Columbia softwoods.** *For. Prod. J.* 7 (10), 1957 (368–71).

Describes an experimental kiln at the Vancouver Forest Product Laboratories and results of trial runs at varying air circulation speeds, temperatures (maximum dry-bulb 265° F.), humidities etc., with 1-in. Western Hemlock and Douglas Fir. Degrade through checking was not severe. There was some darkening of colour.

2470. CLEGG, W. **The effect and control of shrinkage during the kiln-drying of species of the genus *Quercus*.** *Timber Technol.* 65 (2222), 1957 (623–6). 8 refs.

Sample boards, 4–5 ft. long, of the groups English Oak (A), Slavonian Oak (B), American White Oak (C), and Japanese Oak (D) [botanical identities not further specified] were seasoned in a double-stack, overhead-internal-fan kiln, the boards being arranged so as to enable observations to be made of conditions of drying in top, central, and bottom areas, and in inlet, centre and outlet sections across the stack. Stickers (of *Anisoptera* sp.) 2 in. longer than the width of the stack were used. The widest spacing of stickers consistent with negligible degrade was 16 in. for A and D, and 20 in. for B and C, and the maximum allowable overhang of the ends of boards over stickers was 9 in. for A and D, and 12 in. for B and C. Arrangements and schedules used for the individual timbers are described, and the sample runs of 1-in. boards are graphed for each. Marked differences were observed in the behaviour of the 4 timbers as regards surface checking, degree of distortion, and case-hardening. The transverse-shrinkage differential (tangential/radial shrinkage ratio) was found to be ca. 2 for A, B and D, but only 1.33 for C. The author considers that there might be some link between the height of rays on tangential surfaces and the checking; the higher the rays, the more rapid the loss of moisture, resulting in an early development of stresses. However, the differences in behaviour between the 4 timbers could not be definitely correlated with differences in structure. To minimize degrade, the author recommends using all the accessories (base members, stickers, etc.) of specified dimensions, to ensure maximum mechanical restraint to distortion. At no time should the drying be conducted so as to produce a m.c. difference > 8% between the surface and centre of timber. Kiln temperatures should not exceed 130° F. for A and D, and 135° for B and C.

2471. KEMP, A. K. **Study of factors associated with the development of collapse during kiln drying**

**of Aspen lumber.** *Abstr. of thesis, in Dissert. Abstr.* 17 (9), 1957 (1858–9). O.R.S.

Factors studied were temperature, humidity, sp. gr., water and air volume, rate of drying, and behaviour of heartwood, sapwood and wetwood.

2472. BOLLMANN, L. **Holztrocknung mit und ohne Ventilatoren. [Drying of timber with or without fans.]** *Holz-Zbl.* 83 (125), 1957 (1521–4). 10 refs. [G.]

A comparison of energy balance and costs of the two systems, worked out on a fictitious example, indicates that despite slightly higher calorie requirements to reduce 1 kg. of moisture, fan drying does the job more than twice as fast and is both more economical and productive of a superior article.

2473. KREUZER, A. **Künstliche Trocknung waldfrischer Buche in Umluftkammern und Zentrifugen. [Artificial seasoning of green Beech wood in turbulent-air and spiral air-circulation driers.]** *Holz-Zbl.* 83 (140/141), 1957 (1705). [G.]

Gives drying schedules for boards 47 mm. thick with an initial moisture content of 94–95%, dried to 9%. In the turbo-drier, time taken was 150 hours (moisture reduction 0.565%/hr.), in the spiral air-circulation drier, 123 hours (mean moisture reduction 0.7%/hr.).

2474. VODOZ, J. **Eine neue Versuchsanlage zur Prüfung des Verhaltens der verschiedenen Holzarten bei der Hochfrequenz-Trocknung. [A new experimental set-up for studying the behaviour of various wood species in H.F. drying.]** *Holz Roh- u. Werkstoff* 14 (10), 1956 (407–9). 2 refs. [G.] P.R.

Illustrated description, preliminary to a thesis. A graph shows the temperature, moisture content and pressure curves obtained with the apparatus, for two woods (one of the family Meliaceae and the other of the Sterculiaceae).

2475. EFIMOV, G. V., and STEPANOV, N. N. **Suška i propitka buka petrolatumom. [Drying and impregnation of Beech wood with petrolatum.]** *Lesn. Prom.* 1956 (4), (15–6). [Russ.]

Illustrated description of an installation consisting of 2 steam-heated tanks with cover (12 cu.m. each), which are half-filled with petrolatum and heated to 140–150 and 80–90° C., respectively. *Fagus orientalis* staves are dried in the hotter bath for ca. 2½ hours, then transferred to the colder bath for 30–40 min. During the process the wood is both seasoned from ca. 80 to 23–26% m.c. and impregnated with petrolatum. [Cf. *F.A.* 18 No. 1098.]

#### 848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 1789–90, 2423, 2467.

2476. STOUT, A. W. **Water sprinkling protects decked logs.** *Research Note, Western Pine Association, Portland, Ore.* No. 2.114, 1955 (rev. 1957). pp.6.

In all tests where adequate water was used, logs suffered little or no storage loss from end checks, splits, bluestain or insect damage. Fire-damaged logs, infected with fungi and insects when put under the sprinkler, were held over one summer without

further degrade. Equipment costs were \$0.50–\$1.00 per 1000 bd. ft. covered; water consumption was ca. 50 gal./min. per million bd. ft.

2477. ANASKIN, K. F. Pogruzka rudničnoj stojki v kontejnerah. [Loading of pitprops in containers.] *Lesn. Prom.* 1955 (11), (14–5). [Russ.]

Illustrated description of the design and use of open-top crates, consisting of 2 rigid U-shaped frames—each made of 3 lengths of wooden poles 10 to 15 cm. diam. socketed in iron elbows (20 cm. long, 1 cm. thick)—which are joined by two transverse wooden elements. The crates filled with props are loaded by crane.

2478. B.M.C. timber-carrying attachment. *Timb. Tr. J.* 223 (4237), 1957 (85).

Describes the British Hoist and Crane Co. 'Iron Fairy', costing £2,345, a hydraulic mobile crane, designed to carry loads of long timber up to 30 cwt. and 2 ft. wide by 3 ft. deep, through narrow (7 ft. 9 in.) doorways. Loads can be slewed through 90° and rest on a platform telescopically adjustable to support awkward lengths. Road speed is 20 m.p.h.

2479. Fork lift with 'reach' action. *Timb. Tr. J.* 223 (4238), 1957 (81).

Illustrates a German machine (obtainable from G. Hunter, (London) Ltd., 80 Fenchurch St., E.C.3) lifting up to 2200 lb. at 25-in. centres. A palletted load (39 × 30 in.) at 18 ft. [lift?] can be set down in a 70-in. gangway. The truck (3500 lb.) is light enough to use in upper storeys. Loads are taken in 3 directions and carried within the wheel base. The stacking mechanism travels 24 in. in either direction.

2480. DICKEY, M. B. Lumber handling with fork trucks and straddle carriers. *For. Prod. J.* 7 (10), 1957 (382–5).

Discusses their relative uses, operation costs, yard lay-out, preparation of timber for easy handling, loading and unloading of railway trucks and lorries, kiln loading, and special fork-lift truck attachments for the timber and pulpwood industries.

2481. Packaged lumber shipments double receiving yard capacity. *Sth. Lumberm.* 194 (2436), 1957 (56).

Describes the 'interlace securement' method of packaging and loading, in which packages of 4 boards, with stickers, strapped by steel tape, are stacked in railway trucks, usually in 4 stacks, 3 packages wide and 2 high; the packages are secured to the others of the same stack by steel straps threaded through the middle of the top and bottom layers.

## 85. Grading of Wood and Wood Products

### 851. Timber Quality in General

See Nos. 1558–9.

### 852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 1861–3, 2064, 2263–4, 2446, 2458, 2465, 2470–1.

2482. BANKS, C. H. The effect of nodal swellings on the strength properties of *Pinus patula*. *J. S.*

*Afr. For. Ass.* No. 28, 1956 (27–34). [E.e.afrik.]

These swellings of occlusion wood covering branch stubs at the whorls are commonly more pronounced on one side (*A*) of the log than the other (*B*). Such knobbly logs were sawn up, keeping sides *A* and *B* distinct and test pieces from the peripheries of both were further separated into (*a*) straight-grained internodal and (*b*) wavy-grained nodal. *A* (*a*) was significantly stronger in modulus of rupture than *A* (*b*), and *B* (*a*) significantly stronger than *B* (*b*), a similar trend being shown in compression ||. The knobbly material was generally superior in hardness and compression ⊥. If timber of equal density were examined, the superiority in bending strength of (*a*) material would probably rise in significance while the difference in hardness would sink to non-significance.

2483. KENNEDY, R. W., and ELLIOT, G. K. Spiral grain in Red Alder. *For. Chron.* 33 (3), 1957 (238–51). 6 refs.

The occurrence and severity of spiral grain in *Alnus rubra* was investigated on two sites, one poor and one medium-good. The changing spiral was measured at breast height and at 10-ft. intervals above ground level. No straight-grained tree was found on either site, and it is concluded that the feature is genetically controlled, though the amount of spirality is affected by growth rate. Individual trees vary greatly, but the general spiral pattern is the same—an initial right spiral, followed by an increasing left spiral. The possibility of controlling growth rate so as to have as little spiral as possible in the outer wood of the tree, is discussed.

2484. ERDEŠI, J. Usukanost kod jasena. [Spiral grain in Ash.] *Šumarstvo* 10 (5/6), 1957 (345–50). 1 ref. [Serb.e.f.]

In 1954–56, 1500 logs of *Fraxinus angustifolia* from a 100- to 120-year-old mixed stand in the Bosut river basin were examined for spiral grain. Part of the bark of each log was removed and the slope of the grain measured for the length of one metre. Spiral grain was found in 17.3% of the logs measured, affecting 19.6% of the total b.a. As the grain did not, in most cases, follow the grooves in the bark, spirality could not be detected from outside. It was commoner in logs of large diameter, the frequency increasing from 13.4% for the 25–29 cm. diam. class to 25.8% for the 50–59 cm., and it put 5.2% of the logs below standard grade. Eight of the logs had small exterior protuberances, 1–3 cm. long, in one of which spirality ran counter to the spiral grain of the stem. These protuberances, mostly found beneath the crown and not in the butt log, occasionally in a series one above the other, are attributed to wind and irregular growth and are not considered to be hereditary.

2485. VINȚILĂ, E., and NIVIN, S. Crăparea buștenilor de fag și măsuri de prevenire. [Shakes in Beech logs and measures to prevent them.] *Industr. Lemn.* 6 (10), 1957 (369–71). 8 refs. [Rum.russ.g.f.e.]

Describes the use of metal rings on veneer logs to prevent or minimize shakes.



2486. **Shrinkage and distortion in sawn Ponderosa Pine.** *Rep. For. Timb. Bur. Aust.* 1956, 1957 (27).

A comparison was made of logs from (a) a 27-year-old plantation spaced  $6 \times 6$  ft., and (b) a 23-year-old plantation spaced  $12 \times 12$  ft. Boards sawn from (a) shrank less and behaved better on drying than those from (b).

2487. HARZMANN, L. J. Das Holz anbauwürdiger Schwarzpappelhybriden. [The wood of usable Black Poplar hybrids.] *Holz-Zbl.* 83 (123), 1957 (1503-6). 17 refs. [G.g.]

Analyses the influence of heredity, site, and treatment on the defects (crookedness, knots etc.), of *Populus nigra* and 5 hybrid varieties from 12 stands grown on suitable sites. Any genetical differences in knottiness are largely masked by the effects of silvicultural treatment. The incidence of discoloration and bark pockets caused by the bark disease 'Braunfleckengrind' appears to be connected with reduced vitality from lack of growing space. The diagnosis of knots and other defects (epicormics, woodpecker holes, lesions) from features of the bark is discussed with illustrations.

### 853. Grading of Wood in the Rough

See also No. 2186.

2488. Normas para la clasificación de maderas de Guinea. [Standards for grading timbers of Guinea.] *Hoja divulg. Serv. Madera, Madrid* No. 1, 1957. pp. [2]. [Span.]

2489. SEKHAR, A. C. Notes on grading of timbers in India. Forest Research Institute, Dehra Dun. 1957. pp. 11. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Outlines various grading systems used.

2490. PLATTE, G. Zur geschichtlichen Entwicklung der Rohholzsartierung. Eine theoretische Untersuchung zur Frage der Weiterentwicklung der Homa von 1936. [The development of assortments of wood in the rough. A theoretical investigation of problems concerning a revision of the German sorting rules of 1936.] *Holz-Zbl.* 83 (123), 1957 (1491-4, 1498). [G.]

Traces the history of the practice in the forest and the standards laid down for it, originally based chiefly on ultimate use but gradually defining more assortments by size and measurable defects; discusses the application of the principles in the Homa (Holzmessanweisung) of 1936 and the changes desirable to bring it into line with changing trends in demand, e.g. for smaller dimensions in building, new industrial uses for stacked wood etc.; and presents proposals for revised classifications by size, quality and uses. [A shorter version may be found in *Forst- u. Holzw.* 12 (19), 1957 (331-4).]

2491. KNIGGE, W. Entwicklung, Stand und Aussichten der deutschen Rundholzsartierung. [History, present state and prospective development of German grading rules for round wood.] *Forst- u. Holzw.* 12 (19), 1957 (329-31). 8 refs. [G.g.]

The framework of Homa (Reichs-Holzmessanweisung 1936) with its fairly broad classification

by size and quality is considered to be well adapted to present market conditions, but criteria for quality grading need bringing up to date, and measuring rules (rounding off etc.) could be improved.

### 854. Grading of Converted Timber

See also Nos. 2488-9.

2492. WARD, W. C. The importance of grading in timber utilisation. New Zealand Forest Service, Wellington. 1957. pp. 16. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the grading of *Pinus radiata*, quoting extracts from *New Zealand Standard* No. 169 [see *F.A.* 18 No. 4741] and suggesting modifications.

### 859. Grading: Miscellaneous

2493. New machine prints pattern on plywood. *Veneers & Plyw.* 51 (10), 1957 (21, 24). P.R.

Illustrated description of 'Panelcraft', a new machine to print cutting patterns or identification markings on standard plywood panels.

### 86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

### 861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 2149, 2320-2, 2331, 2369, 2401, 2550.

2494. GRANT, J. Fundamental research on paper-making fibres. *Nature, Lond.* 180 (4596), 1957 (1175-7).

Account of a symposium held at Cambridge, 23-27 Sept. 1957, organized by the British Paper and Board Makers' Association. Papers were read on: general structure of fibres (*A. Frey-Wyssling*); discontinuities in the microscopic structure of wood fibres (*H. Bucher*); structure of the outer secondary wall (*H. W. Emerton*); fine structure of cellulose fibrils (*B. Rånby*); carbohydrate composition of Spruce pulps (*L. Jørgensen*); distribution of cellulose, hemicellulose, and lignin in cell walls of Spruce, Birch, and cotton (*P. Lange*); pulping qualities of reaction wood (*H. E. Dadswell, A. B. Wardrop and A. J. Watson*).

2495. MOTTET, A., and QUOLIN, J. Variation de la longueur des trachéides et de l'épaisseur de leurs parois chez quelques résineux. [Variations in the length of tracheids and in the thickness of their cell walls in some conifers.] *Bull. Inst. agron. Gembloux* 25 (1/2), 1957 (116-38). 7 refs. [F.] E.M.B.

Reports on the following investigations: (1) Measurements of lengths of tracheids and variations with age and diameter of the log. (2) Variations in length within two complete stems of Austrian Pine and Japanese Larch. (3) Variations in cell-wall thickness, exterior diameter, and the diameter of the lumen, in sections under the microscope. As regards (1), Larch attains high average fibre lengths with maturity and merits consideration by manufacturers of sulphate pulp. *Pinus nigra* var. *calabrica* is unsuitable because of low tracheid length. Results with other species were less

conclusive but *Picea abies* shows possibilities. Young *Pinus sylvestris* from thinnings gave pulps inferior to those from larger logs. No general conclusions were drawn on (2). As regards (3), tracheids of the early wood will give compact papers with good tensile and bursting strength, but lower tearing strength, whereas late-wood tracheids will give a paper with high tearing strength, but less good tensile strength. Japanese Larch showed a marked superiority in cell-wall thickness and is again recommended for kraft pulps.

2496. BHAT, R. V., and JASPAL, N. S. **Indigenous cellulosic raw materials for the production of pulp, papers and board. Part XXX. Wrapping papers from Castor stem (*Ricinus communis* Linn.).** *Indian For.* 83 (10), 1957 (614-20 + specimen sheet). 2 refs.

Good-quality wrapping paper was made from 100% Castor stem pulp, and also from a 70/30 mixture of this and Bamboo kraft pulp.

2497. SOMERSET, H. B. **Eucalypt utilisation at Burnie, Tasmania.** Associated Pulp and Paper Mills Ltd., Burnie, Tasmania. 1957. pp. 6. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Describes the development of a fine-paper industry based on Eucalypts as the raw material.

2498. LEWIN, M., and REIBENBACH, A. **The chemical composition and fibre properties of *Tamarix articulata* from the Negev.** *Repr. from Bull. Res. Coun. Israel* 6A (3/4), 1957 (256-70). 18 refs. P.R.

Presents the results of investigations on the chemical composition, fibre dimensions and pulping behaviour of *T. articulata*, compared with other woods.

2499. DOYLE, J. A., and BENDER, F. **Wood residues as pulp material and developments in wall-board production [in Canada].** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 6, 1957. pp. 19. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2500. BELL, G. E. **Economics of barking and chip production [from sawmill waste]: a report based on sawmills in Eastern Canada.** *Unasylva* 11 (4), 1957 (154-9). 3 refs.

The report covers costs of barking, chipping, transport and handling, allocation of raw material, and overheads.

2501. JENSEN, W., et al. **Chemigroundwood-massa pienpuusta. [Chemigroundwood pulp from small wood.]** *Pap. ja Puu* 39 (9), 1957 (405 . . . 416). 15 refs. [F.i.e.] P.R.

Chemigroundwood pulps of Pine and Birch were compared with different Spruce pulps. Results are tabulated. Strength properties were above or equal to mechanical Spruce pulp, and power consumption was lower. Pine pulp drained badly. The Birch pulp was equal to Birch semichemical pulp for corrugating material, but the Pine pulp was unsuitable.

2502. KELLER, E. L., KINGSBURY, R. M., and FAHEY, D. J. **Papers and boards from Hickory**

**neutral sulfite semichemical pulps.** *Rep. U.S. For. Prod. Lab., Madison* No. 2088, 1957. pp. 10 + 10 tpls. 3 refs. P.R.

Presents results of cooking tests with *Carya tomentosa*, *C. glabra*, *C. pallida* and *C. ovata*.

## 862. Composite Materials made Wholly or Partly of Woody Matter

See also No. 2499.

2503. CRANCH, R. C. **What wood can you use in particle board?** *Wood, Chicago* 62 (10), 1957 (24-5). P.R.

Tabulated lists of species and mixtures of species used for chipboard manufacture in North America and in Europe.

2504. VA. **Neue Wege in der Spanplattenfertigung. [Modern methods in the manufacture of chipboards.]** *Holz-Zbl.* 83 (126), 1957 (1543). [G.]

Describes the lay-out and the highly automatic, continuous-flow processes of a recently erected mill (Danzner and Wessel KG, Kehl) producing quality chipboard veneered on both sides with Abachi, Gaboon, or similar woods. Some 50% of the chipping material is waste from the Company's veneer mills.

2505. SEIFERT, K. **Beiträge zur Analyse von holzhaltigen Werkstoffen. Erste Mitteilung: Zur Analyse von Holzspanplatten. [The analysis of wood-containing materials. Pt. I: Analysis of chipboards.]** *Holz Roh- u. Werkstoff* 14 (9), 1956 (328-32). [G.] P.R.

Presents the results of research on the methods of determining in chipboards the proportion of wood substance, binder (urea resin), and water-repellent agent (mostly paraffin wax). The best method of separating wood substance from the binder was found to be a 24-hour immersion in 30%  $H_2O_2$ . In chipboards made in W. Germany the urea-resin content (including the hardener) was 5-80% in the inner layer and 10-03% in the outer layer.

2506. TALBOTT, J. W., and MALONEY, T. M. **Effect of several production variables on modulus of rupture and internal bond strength of boards made of green Douglas Fir planer shavings.** *For. Prod. J.* 7 (10), 1957 (395-8).

Coarse fractions had higher modulus-of-rupture values, but lower internal bond values in tension tests  $\perp$  to surface than fine fractions. The addition of 0-75% by weight of wax to increase dimensional stability, unexpectedly increased strength properties also, under all conditions of resin content, fraction, and sp. gr. Higher resin %s increased strength but not proportionally.

2507. DAVIS, E. M. **Machining tests for particle board; some factors involved.** *Rep. U.S. For. Prod. Lab., Madison* No. 2072, 1957. pp. 7 + 7 photos, 3 tpls. P.R.

Some of the factors involved in machining chipboards are outlined and practical tests for evaluating the machining properties of different boards are described. The machining operations tested included sawing, planing, sanding, tenoning, shaping, routing and drilling.



2508. KEYLWERTH, R. Dimensionsstabilität und Gleichmässigkeit von Möbel- und Türplatten. [Dimensional stability and uniformity of furniture and door panels.] *Holz Roh- u. Werkstoff* 14 (9), 1956 (353-60). [G.g.] P.R.

The following industrial panels were tested: blockboards of standard type or with cores of veneer strips, 7 types of single-layer or 3-layer chipboards, and 4 types of sawdust door-panels. Swelling in thickness, thickness uniformity, and degree of warping were measured. The test objects were either placed 5 cm. above a water surface in a humid compartment (DIN 52361), or were immersed. It was found that the tested panels had a good degree of dimensional stability. The thickness swelling was more uniform in 3-layer chipboards than in standard-type blockboards; chipboards resisted warping even better than blockboards made from veneer strips.

2509. NARAYANAMURT(H)I, D. Fibre boards from Indian timbers. Forest Research Institute, Dehra Dun. 1957. pp. 16. 17 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Results of studies on e.g. hardwoods, softwoods, Bamboos, bark, show that indigenous materials can be used to make satisfactory boards. Physical and mechanical properties are shown in tables.

2510. ANDERSON, A. B., and HELGE, K. The utilization of unbarked residues in hardboard. *Norsk Skogind.* 11 (9), 1957 (327-30). 10 refs. [E.nor.] P.R.

Preliminary laboratory experiments indicated that unbarked material (slabwood and thinnings) of Spruce and Pine can be used without the addition of bark-free wood. Yields of pulp were slightly lower than for barked wood. Unbarked Pine slabs, with 39% bark, produced a board of good dimensional stability without sizing agents or heat treatment.

2511. Das Verarbeiten von Holzfaserplatten. [Working with fibreboards.] *Holztechnik* 37 (11), 1957 (423-6). [G.] P.R.

Information on choice, cutting to size, nailing and gluing, of insulation boards, hardboards and super hardboards.

2512. Voss, K. Die Verwendung von Klebern bei der Verarbeitung von Holzfaserplatten. [Use of glues in the processing of fibreboards.] *Holz Roh- u. Werkstoff* 14 (8), 1956 (295-303). 6 refs. [G.g.] P.R.

Gives recommendations for the use of special glues with different kinds of fibreboards (sound-insulation boards; parquet and linoleum under-layers; wallboards).

### 867. Destructive Distillation

See also No. 2216.

2513. JUSUPOV, A. F. Prispoblenie dlja raboty traktorov KT-12 na syrom toplive. [Device enabling KT-12 tractors to operate on moist wood fuel.] *Lesn. Prom.* 1955 (11), (8-9). [Russ.]

Illustrated description of a simple steam-ejector

device for removing the gaseous products of wood-chip drying from the storage bins. This makes it possible for the tractors to be fed all the year round with green wood chips.

2514. HANZAWA, M., and SATONAKA, S. Carbonization of wood by dehydrating agent. II. On the preparation and decolorizing power of the hydrated active (H-A) charcoal from Shirakaba (*Betula tauschii*) wood. III. On the adsorption of penicillin on H-A charcoal and its elution with aqueous acetone. *Res. Bull. Exp. For. Hokkaido Univ.* 18 (1), 1956 (113-30). 5 refs. [E.jap.]

(II) Sawdust of this Birch treated with 70%  $H_2SO_4$  at 150° C. for 8 hours yielded 54% charcoal and this showed 83% decolorization power (caramel test), the highest adsorptive power of the test. (III) Using the penicillin purification method (now abandoned), the properties of hydrated active charcoal prepared from woods [cf. *F.A.* 18 Nos. 1144-5] are further examined and compared with those of other charcoals (animal, mandarin peel etc.).

### 89. Other ('Minor') Forest Products

#### 892. Vegetable Products

##### 892.1. Grass. Litter. Leaf Fodder etc.

See Nos. 2094-5.

##### 892.4. Bark Products. Tanstuffs. Cork

See also Nos. 1604, 1793, 2363, 2509-10.

2515. THOMPSON, G. W. H., and AMOS, G. L. The tanning properties of *Pinus radiata* extract. *Aust. J. appl. Sci.* 8 (3), 1957 (198-205). 3 refs. P.R.

Leather tanned with blends of Mimosa and myrabolan tannins, in which  $\frac{1}{3}$  and  $\frac{2}{3}$  respectively of the Mimosa extract were replaced by *P. radiata* extract, gave effective tannage, but yielded dark-coloured leather and formed gummy sludges in the experimental pits. *P. radiata* extract was rather acid and more astringent than Mimosa extract. From authors' summary.

2516. Laboratorio General de Química Forestal. Materias curtientes. [General laboratory of forest chemistry. Tanning materials.] *An. Inst. for. Invest. Exp., Madrid* No. 1, 1956 (74-8). [Span.]

Analyses of the tannin content of bark and wood of *Eucalyptus globulus* showed it to be too low for commercial extraction. In an investigation of the possibilities of using bark of *Pinus sylvestris* left in the forest, it was discovered that after about a year's exposure to the air the tannin content was too much reduced to be worth exploiting. Similar results were obtained with *Pinus pinaster*. Results are also given of analyses of the tannin content of *Quercus ilex* bark.

2517. KING, H. G. C., and WHITE, T. Tannins and polyphenols of *Schinopsis* (Quebracho) spp., their genesis and interrelationship. *J. Soc. Leath. Tr. Chem.* 41 (11), 1957 (368-83). 29 refs. O.R.S.

Chemical examination of commercial quebracho tannin extract (from the heartwoods of *S. balansae* and *S. lorentzii*) disclosed the nature of some of the

polyphenols present and gave evidence of their structural interrelationship. Extracts of leaves, twigs, bark, sapwood and heartwood of these species, and leaves and twigs of *S. heterophylla*, were examined and a number of polyphenols were identified. The leaves were found to synthesize only 'hydrolysable' tannins (galloyl derivatives of carbohydrates) and it is suggested that these constitute the polyphenolic raw material ultimately converted to the typical 'condensed' tannins of the heartwood. Catechin and leucoanthocyanins in the sapwood also participate in the final stages of conversion.

2518. HATHWAY, D. E., and SEAKINS, J. W. T. Enzymatic oxidation of catechin to a polymer structurally related to some phlobatannins. *Biochem. J.* 67 (2), 1957 (239-45). 37 refs. O.R.S.

Phlobatannins isolated in high yield from the extractives of harvested leaves of *Uncaria gambir* and from heartwood of *Acacia catechu* had the same analytical properties as, and similar elementary analyses and absorption spectra to, the polymers obtained by catechin oxidation by mushroom, potato and tobacco polyphenoloxidases. The conclusion is drawn that these phlobatannins are formed by aerobic oxidation of catechin epimers by polyphenoloxidases in the leaves and heartwood respectively. A flavonoid fraction from *A. catechu* contained 3 flavonols, chromatographically indistinguishable from fisetin, quercetagenin, and quercetin. *From authors' summary.*

2519. The sampling of Wattle bark in the plantation. *Rep. Wattle Res. Inst. S. Afr.* 1956/57, 1957 (25).

At present, the only satisfactory method of sampling bark from a tree is by grinding up the whole bark and sampling the product, a laborious process which also destroys the tree. It is known that tannin content of bark, within a single tree, decreases with increasing height, and therefore at some specific height the tannin content will be equal to the mean for the whole bark. This specific height (SH) can be calculated by the formula:

$$\frac{(3D_2^2 + 2D_1D_2 + D_1^2)H}{4(D_2^2 + D_1D_2 + D_1^2)}$$

when  $D_1$  = diameter at bottom of tree,  $D_2$  = diameter at maximum strippable height, and  $H$  = strippable height of tree. Thus, in the theoretical case of an ideal tree, it would be necessary only to take a bark sample at this calculated height in order to get a representative analysis for the whole tree. In practice, owing to local variations in tannin content, it is most unlikely that this would happen. If, however, it is assumed that the variation of tannin content with height is linear, this variation can be expressed by the equation  $Y = mh + c$ , when  $h$  is height up the tree,  $Y$  the tannin content, and  $m$  and  $c$  are constants varying from tree to tree. Thus by collecting pellet samples at known heights spread over the strippable height of the tree and analysing them,  $m$  and  $c$  can be calculated. By substituting the calculated height  $SH$  for  $h$  in the equation, a figure equal to the mean tannin content should be obtained. As a test, 9 trees were sampled

as above, and the figure obtained in each case compared with an analysis of the whole bark of the tree. The results gave a consistent over-estimate, but the variance of error was not large (0.7970) and further work to determine its origin appears to be justified.

2520. ROUX, D. G. The estimation of tannins in Black Wattle barks and commercial 'Mimosa' extracts. Parts II and III. *J. Soc. Leath. Tr. Chem.* 41 (8), 1957 (275-300). 32 refs. O.R.S.

(II) Comparison of the official hide-powder method and photometric methods. (III) Critical examination of the hide-powder method.

2521. GORDON-GRAY, C. G. A comparison of the results of estimating Black Wattle tannin by the official hide powder method and by a proposed ultra-violet spectrophotometric method. *J. Soc. Leath. Tr. Chem.* 41 (8), 1957 (269-75). 1 ref. O.R.S.

2522. EVELYN, S. R. The molecular weight of Black Wattle tannins. Part III. A note on the variations within and between trees. *J. Soc. Leath. Tr. Chem.* 40 (10), 1956 (335-8). O.R.S.

Three mature trees and one young one were sampled at various selected heights. Molecular-weight values showed tree-to-tree variation at various heights. No correlation was found between height of sampling and molecular weight, high-molecular-weight tannins being present even in the youngest strippable bark.

2523. RAO, P. R. Utilization of Mangrove bark extracts in the tanning industry. *Indian For.* 83 (9), 1957 (565-8). 3 refs.

It has been found that blends of 3-4 parts of Mangrove (*Ceriops roxburghiana*) bark with one part of myrobalan give satisfactory results. Details are given of the method of preparing the extract.

2524. VARMA, M. K. U., MATHEW, E. C., and DAS, B. M. New barks for E.I. tannage—I. *Peltophorum ferrugineum*. *Bulletin, Central Leather Research Institute, Madras* 2, 1956 (204). From abstr. in *J. Soc. Leath. Tr. Chem.* 41 (1), 1957 (34). O.R.S.

The bark can be used alone or mixed with myrobalan or Konnam [*Cassia fistula*] bark. It may possibly prove a good substitute for Wattle bark.

2525. VARMA, M. K. U., MATHEW, E. C., and DAS, B. M. New barks for E. I. tannage—II. *Pithecolobium dulce*. *Bulletin, Central Leather Research Institute, Madras* 3, 1956 (7). From abstr. in *J. Soc. Leath. Tr. Chem.* 41 (9), 1957 (328). O.R.S.

The bark contains ca. 25% catechol-type tannin and, blended with *Cassia fistula* bark, gives a product which may replace that obtained with Wattle tannage.

2526. MAYER, W. Catechins from the bark of Oak and Sweet Chestnut. *Abstr. in J. Soc. Leath. Tr. Chem.* 40 (4), 1956 (119). O.R.S.

Crystalline *d*-gallo catechin and *d*-catechin can be isolated from bark of *Quercus sessiliflora* and *Castanea sativa*.



2527. KOTÁSEK, Z. **Polyuronides in aqueous extracts of Spruce bark.** *Věda a Výzkum v Průmyslu Kožedělném*, [Czechoslovakia] 1, 1956 (47-61). [Cz.e.] From *abstr.* in *Chem. Abstr.* 51 (16), 1957 (12525). P.R.

The products of acid hydrolysis of the ethanol/acetone precipitate from aqueous solutions of *Picea abies* bark, as identified by paper chromatography, are: *D*-galacto-uronic acid, arabinose, glucose, galactose and, probably, xylose and rhamnose. The probable structure of the polyuronic acid molecule is discussed.

2528. ANDRADE, A. B. L. D'. O laboratório da Junta Nacional da Cortiça e a indústria corticeira. [The laboratory of the National Cork Association and the cork industry.] *Bol. Junta nac. Cortiça, Lisboa* No. 226, 1957 (287-9). [Port.]

Short notes on the laboratory (founded in 1944) and on its present and future programme.

#### 892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 1555, 1651, 1692.

2529. HUNDLEY, H. G. A report of research work on medicinal plants and their products [in Burma]. *Burmese For.* 7 (1), 1957 (44-56).

2530. YAGISHITA, K. Isolation and identification of  $\alpha$ - and  $\beta$ -amyrin. I. Isolation from *Ilex latifolia*. II. Isolation from *Ilex crenata*. *Bulletin of the Agricultural Chemical Society, Japan* 21, 1957 (157-65). [Jap.?] From *abstr.* in *Chem. Abstr.* 51 (20), 1957 (15718). P.R.

(I) Two triterpenoid alcohols,  $\alpha$ - and  $\beta$ -amyrin, were isolated from the unsaponifiable fraction of the ether extract of *I. latifolia*; stearic acid also from the fatty-acid fraction of the hydrolysates.

(II) Ilexol,  $\alpha$ - and  $\beta$ -amyrin, and stearic acid were isolated from the ether extract of the bark of *I. crenata*.

2531. CHAKRAVARTI, D., CHAKRAVARTI, R. N., and GHOSE, R. Triterpenes of *Alstonia scholaris* (Dita-bark). *Experientia, Basle* 13 (7), 1957 (277). 2 refs. [E.f.] O.R.S.

2532. SVOBODA, G. H. A note on the root bark alkaloids from *Alstonia constricta* F. Muell. *J. Amer. pharm. Ass. (sci. Ed.)* 46 (8), 1957 (508-9). 3 refs. O.R.S.

A sample examined indicated that the root bark could not be considered an economic source of reserpine.

2533. RANGASWAMI, S., and RAO, E. V. Active principles of *Cerbera odollam* Gaertn. *J. sci. industr. Res. India* 16B (5), 1957 (209-12). 16 refs. D.S.I.R.

The seed kernel yielded, on extraction with solvents and fractionation, a number of crystalline and amorphous glycosides, the principal crystalline glycosides being identified as cerberin, neriifolin and thevetin. From authors' summary.

2534. GELLERT, E. Some non-alkaloidal constituents of the bark of *Teclea grandifolia* Engl. *Aust. J. Chem.* 10 (2), 1957 (208-9). 2 refs. O.R.S.

#### 892.6. Resin and Turpentine. Essential Oils.

Fixed Oils and Fats. Gums. Latex.

Dyestuffs. Sap Sugar

See also Nos. 1463, 1774.

2535. MINSHALL, W. H. Rubber and resin content of native and introduced plants of Canada. Department of Agriculture, Ottawa. [n.d.] pp. 53. 5 refs.

Some 1800 samples representing over 300 species, including trees and shrubs, were analysed for resin and rubber content. Results are tabulated. Genera containing species with a benzene extract (rubber content) in excess of 1% of dry weight included *Euonymus* and *Lonicera*, and those with an acetone extract (resin content) above 20% of dry weight, *Acer*, *Betula*, *Euonymus*, *Lonicera* and *Rhus*.

2536. BRAUN, J. C., and PATTON, E. L. Some recent advances in Pine gum chemistry. *For. Prod. J.* 7 (10), 1957 (338-41). 26 refs.

Includes research methods and equipment, composition of resin, turpentine, and rosin, new products and their manufacture, and lines of future research, in the U.S.A.

2537. SOEPARDI [SUPARDI], R. Damar atjeh setahun 'eksploitasi' getah *Pinus merkusii*. [Annual production of resin of *P. merkusii* at Atjeh [N. Sumatra].] *Rimba Indonesia* 6 (6/8), 1957 (209-37). [Jav.jav.e.]

Data given, mainly for 1954, include area tapped, yields per ha., per cup, or per worker, costs at the mill site, amounts distilled, turpentine and rosin produced, and total costs per kg. of turpentine and rosin. From author's summary.

2538. HANDA, K. L., CHOPRA, I. C., and SOBTI, S. N. Aromatic plant resources of Jammu and Kashmir. *J. sci. industr. Res., India* 16 (5), 1957: suppl. pp. 1-28. 26 refs. D.S.I.R.

Describes over 70 plants (including several tree species) which grow in these provinces and are used as sources of aromatic oils.

2539. MCILROY, R. J. *Combretum verticillatum* gum. *J. chem. Soc.* Sept. 1957 (4147-8). 7 refs. O.R.S.

Chemical analysis.

2540. TORTO, F. G. The gum of *Fagara xanthoxyloides*. *Nature, Lond.* 180 (4591), 1957 (864-5). 5 refs.

The gum appears to be composed of labile *l*-arabinose residues, linked to a more resistant framework of *d*-galactose and 4-*O*-methylglucuronic acid units, thus bearing a superficial resemblance to gum myrrh.

#### 892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 1458, 1463.

2541. SHIMIZU, U. [On the keeping rate of Chestnut, *Castanea crenata* and *C. mollissima*.]

*Misc. Inform. Tokyo Univ. For.* No. 11, 1956 (87-97). 2 refs. [Jap.jap.e.]

The keeping quality of seed of many varieties and hybrids of these two species was tested. In *C. crenata*, nuts ripening before 20 Sept. stored badly. Varieties ripening later generally stored well. These differences were not noticeable in *C. mollissima*. The keeping quality (k.q.) of its nuts was generally good. The variety of the ♂ parent did not, but that of the ♀ parent did affect the k.q. In some varieties k.q. was better in years of late ripening, and within the same year the k.q. was better in those districts where nuts developed later.

## 9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY.

### 90. General

2543. HAILEY, LORD. **An African survey: a study of problems arising in Africa south of the Sahara.** Oxford University Press, London. Revised 1956 (1957). pp. xxviii + 1675 + 3 maps. Price £5. 5s. [Cf. *F.A.* 8 No. 789.]

A comprehensive survey including chapters on the land; agriculture and animal husbandry; forests; water supply and irrigation; and soil conservation.

2544. VERNÈDE, H. L. **Rapport au Gouvernement de l'Éthiopie sur les forêts et le développement économique.** [Report to the Government of Abyssinia on forests and economic development.] Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 675, 1957. pp. 87. [F.]

Gives an account of existing forest practice and forest resources and makes suggestions for future policy.

### 902. History of Forests and Forestry

See also Nos. 1774, 2589, 2591.

2545. DUVAL, M. **Recherches sur l'économie forestière des pays de l'Ouest dans la seconde moitié du XVI<sup>e</sup> siècle.** [The forest economy of Western [European] countries in the second half of the 16th century.] *Rev. for. franc.* 9 (12), 1957 (880-6). 8 refs. [F.]

2546. SCHLÖGL, A. [Editor]. **Bayerische Agrargeschichte. Entwicklung der Land- und Forstwirtschaft seit Beginn des 19. Jahrhunderts.** [History of Bavarian agriculture. Development of agriculture and forestry since the beginning of the 19th century.] Bayerischer Landwirtschaftsverlag, München. [1956?] pp. 925. [G.] Price DM.26. From review in *Allg. Forstzeitschr.* 11 (19), 1956 (253, 256).

Includes a section on game (pp. 36) and one on forestry (pp. 126, chiefly by *E. Elsner*) covering state, communal, corporation and private forests, administration, management, legislation, utilization, prices of products, labour etc., from official sources.

2547. LÜTKEMANN, J. **Wandlungen im Bestockungsaufbau des Hessen-Darmstädtischen Waldes.** [Changes in the species composition of the forests in

892.8. **Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials**

2542. Buigbaarheid van rotan. [Flexibility of rattan canes.] *Meded. Inst. Trop. Amst.* No. 125 (*Afd. trop. Prod.* No. 48), 1957 (49-53, 67). [D.u.e.]

Tests on New Guinea material showed great variations in behaviour of bends (wrinkling, furrowing, or breaking). No correlation was found between bending and thickness and weight of the canes. Finely ribbed canes were weaker than smooth ones, and those with cracks in the epidermis tended to break in bending.

the district of Darmstadt, Hesse.] *Allg. Forst- u. Jagdztg.* 128 (10/11), 1957 (232-44). 44 refs. [G.g.e.]

Traces the gradual advance of conifers, which now cover ca. 51% of the area, and particularly the increase of pure Spruce, largely on the basis of official sources and forestry directives of the 19th century, discussing its causes and the degree to which it was, or still is, justified, and making recommendations for increasing the areas under mixed forest with careful consideration of site conditions etc.

### 903. Forest Policy, General

See also No. 2193.

2548. SINGH, J. A. **The national forest policy of India.** [Forest Research Institute, Dehra Dun.] 1957. pp. 5. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Discusses the policy formulated in 1952 [cf. *F.A.* 14 No. 1796; 17 No. 4612].

2549. SLOAN, G. M. **Public Inquiries Act (British Columbia): Report of the Commissioner . . . relating to the forest resources of British Columbia, 1956.** The Queen's Printer, Victoria, B.C. Vols. 1-2, 1957. pp. 888 + map.

When the Commissioner reported on the forest resources of British Columbia in 1945 [cf. *F.A.* 8 No. 2830], he recommended that another Royal Commission should be appointed in 10 years' time, to re-examine forestry problems in the light of experience gained during the decade. The present report, the result of this second commission, carries out this recommendation and gives detailed accounts of evidence from expert witnesses on forest management, administration etc.

2550. PEEL, J. D. **The case for investigating the establishment of pulpwood plantations in Malaya for paper production.** *Malay. Forester* 20 (4), 1957 (187-96). 18 refs.

Considers the likelihood of the establishment of a paper mill using Malayan wood pulp, discusses the difficulties that may be encountered in using the 'non-timber' woods in Malayan forests, i.e. mixed tropical hardwoods, and concludes that they are an unattractive raw material and unlikely to be used



indefinitely in preference to planted pulpwood. The establishment of such a mill should not take place for some years, and current research should therefore be directed towards the recommendation of suitable species for planting rather than the use of non-timber wood in existing forests. *From author's summary.*

2551. GRAY, H. R. **A desirable balance between hardwood and softwood production in Australia.** Government Printer, Canberra. 1957. pp. 13. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

#### 904. General Regional Accounts of Forests and Forestry

2552. PARDE, J. **Le mouvement forestier en Allemagne fédérale. [Forestry in the German Federal Republic.]** *Rev. for. franç.* 9 (12), 1957 (869-79). [F.]

Briefly describes forest administration, silvicultural techniques etc. and compares some forestry statistics with similar ones for France.

2553. HUMMEL, F. C. **Report on visit to Soviet Union.** *Emp. For. Rev.* 36 (3), 1957 (251-65).

General notes on forests and forestry, with some observations on research institutes, training centres, and shelterbelts.

2554. **Statement by the Inspector-General of Forests, Government of India in collaboration with the heads of state forest departments in India and the States of India. Part I India; Part II Reports from the States.** Ministry of Agriculture, New Delhi. 1957. pp. 25 + pp. 130. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2555. HUMPHREY, N. **A review of agriculture and forestry in the Island of St. Helena (with special reference to the work of the Department of Agriculture and Forestry).** The Crown Agents for Oversea Governments, London. 1957. pp. 88 + map. 11 refs. Price 15s.

2556. **Statement by the Forestry Division Somaliland Protectorate.** Department of Agriculture and Veterinary Services, Hargeisa. 1957. pp. 19. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2557. BATES, J. S., *et al.* **Report of the New Brunswick Forest Development Commission.** [Government Printer] Fredericton, N.B. 1957. pp. 154 + map. 46 refs.

The terms of reference of the Commission were to study and report to the Government of New Brunswick on the forest resources of the Province, their protection, development and utilization, including marketing, manufacturing methods, administration of Crown forests, control of felling on private property etc. This final report covers these subjects and includes a number of statistical tables.

2558. **Forestry in Western Australia.** *Bull. For. Dep. W. Aust.* No. 63, 1957. pp. 185 + map.

Includes chapters on: forest policy, forest botany,

forest types, protection, Pine plantations, forest management, utilization and forest products, research and training, and afforestation; with appendixes (list of Eucalypts, summary of exports, imports, and production, physical properties of timbers and trees suitable for planting in W. Australia).

2559. BEDNALL, B. H. **Forestry handbook [for South Australia].** *Bull. Wds. For. Dep. S. Aust.* No. 6, 1957. pp. 104 + 5 maps. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2560. **Handbook on forestry in the Australian Capital Territory.** Government Printer, Canberra. 1957. pp. 35 + map. 3 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2561. FERGUSON, K. V. M. **Handbook of forestry in Victoria.** *Misc. Publ. For. Comm. Vict.* No. 7, 1957. pp. 64. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

2562. WOMERSLEY, J. S., and MCADAM, J. B. **The forests and forest conditions in the territories of Papua and New Guinea.** Government Printer, Port Moresby. 1957. pp. 62 + 2 tbls., 9 photos. 32 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

Describes the principal forest types, summarizes a report on forest resources, and briefly indicates policy, administration etc. Appendixes give native names, notes on silvicultural characters and a key for field identification, of the more important forest species.

2563. BUDOWSKI, G. **Quelques aspects de la situation forestière au Costa Rica. [Some aspects of forestry in Costa Rica.]** *Bois For. Trop.* No. 55, 1957 (3-8). [F.]

Includes some notes on the planting of *Alnus jorullensis* in combination with grazing on volcanic slopes. The Alder, spaced 10 × 10 m., produces useful timber as well as improving the herbage and sheltering the cattle. Notes are also given on *Cupressus lusitanica* in the highlands and care of natural regeneration of *Cordia alliodora* in the lowlands.

#### 905. Forest Statistics and Resources

See also Nos. 2554-62.

2564. **Digest of statistics in country statements for the Seventh British Commonwealth Forestry Conference, Australia, 1957.** Forestry and Timber Bureau, Canberra. 1957. pp. 31.

Statistics include forest areas and populations; forest areas for which base maps have been prepared; volume and increment of permanent exploitable forest; output of home-grown wood; imports and exports of wood and wood products; production, imports and exports of minor forest products; all as at 1955.

2565. STRAND, L., and VIGERUST, Å. Skogarealet i forskjellige høydesoner. [The forest area in different altitudinal zones.] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (635-49). 9 refs. [Nor.]

Tabulated figures show the distribution of forest area, site quality class, and yield by altitudinal zones, for different parts of Norway.

2566. Skogsstatistik årsbok. 1955. [Statistical yearbook of forestry. 1955.] Kungl. Skogsstyrelsen, Stockholm. 1957. pp. 184. [Sw.e.]

2567. CLICHEROUX, E. Quelques données statistiques sur les forêts belges. [Some statistics on Belgian forests.] *Bull. Soc. for. Belg.* 64 (11), 1957 (473-95). [F.]

Presents and discusses statistical data on area and distribution of different types of forest under different systems of management and types of ownership, with some indication of amount and distribution of waste land.

2568. Forest resources inventory 1956. Report No. 1. Southeastern Forest Section. Manitoba Forest Service, Winnipeg. [1957]. pp. 32.

2569. STERNITZKE, H. S., and PUTNAM, J. A. Forests of the Mississippi Delta. *For. Surv. Release Sth. For. Exp. Sta.* No. 78, 1956. pp. 42.

The Delta is here taken to mean the entire floodplain of the Mississippi river in Arkansas, Louisiana and Mississippi, a total of some 28 million acres.

2570. DAVIS, J. Statistics of the forest and forest industries of New Zealand. New Zealand Forest Service, Wellington. 2nd ed. 1957. pp. 35. 36 tbls. [Cf. *F.A.* 15 No. 3139.]

#### 907. Indirect Significance of Forests (Rural Amenities, National Parks, Forest Influences etc.)

See also section 116 and Nos. 1874, 2586.

2571. LOUCKS, O. L. A study of the lakeshore reservations of Pine [*Pinus resinosa* and *P. strobus*], Quetico Provincial Park, Ontario. *For. Chron.* 33 (3), 1957 (213-32 + 4 photos). 2 refs.

The practice of reserving strips of natural forest along recreational lakes, rivers, and highways has become accepted widely by conservationists, with some opposition from forest operators. From a study of the reservations of Pine left in 1943 along the shore of Basswood Lake, Quetico Park, Ontario, it is concluded that shore reservations can be effective in maintaining aesthetic values. A specific pattern in ground vegetation response and a slight improvement in stocking to Pine is obtained in a strip of cut-over bordering the shore reservation. Some blowdown is inevitable, but for the most part, the few pockets of heavy blowdown in shore reservations can be predicted by an evaluation of certain site characteristics. Such pockets should probably be clear-cut at the time of logging. *From author's summary.*

2572. DAVISON, E., SMUTS, J. C., and JONES, R. Whither national parks? (with special reference to Africa). *Oryx* 4 (3), 1957 (189-95).

A symposium, from 3 papers published elsewhere,

on the difficulties faced: the conflict between public enjoyment and preservation; finance; lack of biological survey in boundary lay-out; and antagonism of local populations. Examples are quoted and some solutions offered.

2573. DENNLER DE LA TOUR, G. The national parks and reserves of Argentina. *Oryx* 4 (3), 1957 (159-67).

2574. New Zealand national parks. National Parks Authority, Wellington, N.Z. 1957. pp. 32.

2575. TASSEL, F. La réserve nationale de la Petite-Pierre. [The national [game] reserve of La Petite-Pierre.] *Rev. for. franç.* 9 (10), 1957 (721-44 + 2 photos). 4 refs. [F.]

An account of the establishment, development and management of a reserve for the protection of red deer in the Basses-Vosges.

2576. SERVENTY, V. N. The requirements of a conservation programme. *Oryx* 4 (3), 1957 (199-201).

Summary of paper presented at the biennial Conference of Australian Interstate Fauna Authorities Sept. 1955. Requirements are considered chiefly from the Australian point of view, under the need for modern and flexible legislation, control of reserves (Forest Department considered the best authority), policy, and enlistment of public sympathy.

2577. ZIVNUSKA, J., and SHIDELER, A. A projection of the recreational use of public forest areas in California to 1965. *For. Sci.* 3 (3), 1957 (210-9). 4 refs.

#### 91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 1759-61, 1872, 1886-7, 2174, 2543, 2583-4.

2578. SHIRLEY, H. L. Forestry in an era of change. *J. For.* 55 (10), 1957 (707-10).

A brief review of major developments in New York State, relating to forest and agricultural land use. The need for a clearly-defined policy on forest land is stressed.

2579. Quinquennial reports on afforestation and reforestation programmes or estimates: note by the secretariat. [Docum.] 6th Sess. *FAO European For. Comm. Wkg. Party on Afforestation, Rome* 1957 No. *FAO/EFC/AF/15*, 1957. pp. 17. [F.E.]

Analysis and summary of information for Germany, Austria, Belgium, Denmark, Spain, France, Greece, Ireland, Israel, Italy, Luxembourg, Morocco, Netherlands, U.K., Cyprus, Sweden, Switzerland, Tunisia and Turkey.

2580. Marginal land—the cases for forestry and farming. *Agricultural Review, London* 3 (3), 1957 (58-62). O.R.E.

A review of the Report on Forestry, Agriculture and Marginal Land [see *F.A.* 18 No. 3583], by the 'Economist' Intelligence Unit, examining in turn the cases for forestry and agriculture and their integration (the solution the report recommends) including the changes this would entail in the Forestry Commission's terms of reference.



2581. RIEBEN, E. La forêt et l'économie pastorale dans le Jura. [Forests and pasturage in the Jura.] Forêts et Pâturages, Vallorbe. 1957. pp. 250. 208 refs. [F.f.g.it.e.]

Discusses the history and development of forest pasture in the Jura, where ca. 18,000 ha. of low-yielding forest are still being grazed, the effects on yield and on soil and water conservation etc. Complete separation of forest and pasture is advocated. The legal position and practical problems, including those of pasture improvement, are discussed, with special reference to the author's administration at Cernys de Ballaigues.

## 92. Forest Ownership and Ownership Policy

See also No. 2593.

2582. ANGELY, J. As reservas florestais do Paraná. [Forest reserves of Paraná.] An. bras. Econ. flor., Inst. nac. Pinho No. 9, 1957 (190-2). [Port.e.]

Lists, with occasional descriptive notes, some of the areas declared forest reserves in 1955 by the state's council for the protection of the forests.

2583. KLOSE, Wald- und Agrarstruktur. [The structure of agricultural and forest holdings.] Forst- u. Holzw. 12 (23), 1957 (397-400). 2 refs. [G.]

Discusses plans now put forward in Germany for increasing the viability and economic stability of farms by adding to them woodlands from state or communal forests, and points out that the advantages for farmers unused to forests are doubtful, while the dangers to timber supply, general forest benefits etc. are real. Changes from agricultural crops to forestry on marginal land are also thought to require great caution in view of the large sums invested and the long delay before returns.

2584. BRAEUER, J. Massnahmen zur Verbesserung der Agrarstruktur und ihre Bedeutung für die Forstwirtschaft. [Measures to improve the structure of [German] agriculture, and their forestry implications.] Forst- u. Holzw. 12 (23; 24), 1957 (400-3; 424-5). [G.]

A lecture discussing actual or proposed measures to maintain or restore a prosperous peasantry, chiefly the regulation of land sales, proposals for allotting forest land to farms of marginal productivity, and the afforestation of marginal land.

2585. KUSTER, J. Die Bauernwälder Sloweniens. [The farm forests of Slovenia.] Schweiz. Z. Forstw. 108 (10/11), 1957 (608-10). [G.]

Briefly describes these small and medium holdings still in private hands, ca. 63% of the forest area. Many are selection forests with higher yields and better natural regeneration, though a lower volume of growing stock, than the state forests. The system of state supervision and management, planned deliveries, forest fund contributions, sales cooperatives etc. are discussed.

## 93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 1872-3, 2095, 2582.

2586. GRAFE, H., and KIENITZ, E. Dokumentation von Gesetzen und Verordnungen aus Forstwirtschaft, Forstverwaltung, Holzschutz, Jagdwesen,

Naturschutz der Deutschen Demokratischen Republik. [Documentation of laws and regulations relating to forestry, forest administration, wood preservation, hunting and shooting, and protection of nature in E. Germany.] Verlag Technik, Berlin. 1957. pp. 315. [G.] Price DM.16.00. From review in Forst u. Jagd 7 (9), 1957 (426).

Contains a bibliography of the relevant enactments, the text of some of the most important ones, and a subject index.

2587. MANTEL, [K.] Entwicklung und Probleme der deutschen Forstgesetzgebung, in vergleichender Betrachtung mit dem österreichischen Bundesforstgesetzentwurf. [Development and problems of German forest legislation, compared with the Austrian draft forest law.] Forst- u. Holzw. 12 (18), 1957 (309-13). [G.]

Discusses regional and federal developments in Germany and Austria, and the solutions adopted or proposed for ensuring sustained yield and trained management supervision etc. particularly on small forest holdings.

2588. K. K. Die forstgesetzliche Regelung der Walderneuerung und die Perspektivplanung der Holznutzung in der Sowjetzone. [The legal regulation of reforestation and the planning of future annual cuts in E. Germany.] Holz-Zbl. 83 (126), 1957 (1545-6). 10 refs. [G.]

Discusses legal felling restrictions, obligatory reforestation etc., and the results of these measures and the planned development of the annual cut, increment, growing stock etc., on the basis of official E. German directives, criticizing some of their underlying assumptions.

2589. TRIFONE, R. Storia del diritto forestale in Italia. [The history of forest legislation and administration in Italy.] Accademia Italiana di Scienze Forestali, Firenze. 1957. pp. 375. Many refs. [It.]

2590. Switzerland: Federal Act of 11 October 1902, relating to forests, including amendments of 5 October 1923, 19 December 1951, 23 December 1953 and 23 September 1955. In Food agric. Leg. 6 (1) (XIII 1/55.2), 1957. pp. 15. [E.]

2591. COULON, M. DE. L'économie forestière suisse en période de guerre. [The Swiss forest economy during the war.] Imprimerie A. & W. Seiler, Neuchâtel. 1957. pp. 99 + 5 gphs. 80 refs. [F.]

A thesis presented at the École Polytechnique Fédérale, Zurich. A description and criticism of state control of exploitation, distribution, prices etc. during 1939-45.

2592. BUTHAUD, E. Les droits d'usage en pays forestier Tunisien. [User rights on forest land in Tunisia.] Bulletin Économique et Social de la Tunisie, Tunis Nos. 74; 75, 1953 (98-110; 67-74). 40 refs. [F.] L.S.E.

Traces the development of the legal position, now chiefly defined by the Decree of 13 Sept. 1934 which recognizes local inhabitants' rights to wood and minor forest produce, forest pasture, and certain rights to clearing and cultivation of forest land;

discusses commutation and indemnification, particularly in connexion with colonizing schemes, and forest offences, chiefly regulated in state forests, by the decree of 23 Nov. 1915 and amendments.

2593. **Sloan Report advocates permanent advisory council.** *B.C. Lumberm.* 41 (9), 1957 (84-5, 93). 1 ref.

Recommends that new management licences be limited to 21 years and their issue discouraged for 5 years; regulation of auctions; special licences for small operations; and re-purchase of free grant land for \$108 million. The reactions of affected interests are summarized.

2594. JAMES, N. D. G. **Damage by tree roots.** *J. Land Agents' Soc.* 56 (10), 1957 (394-6).

Summarizes 10 law cases (since 1940) in connexion with claims for damage caused by the roots of trees.

#### 94. Other Methods to Implement Forest Policy

##### 941. State Subsidies etc.

See No. 2199.

##### 945. Advisory Services; Publicity, Propaganda; Education, Training; Research

###### 945.1. Advisory and Information Services, Documentation Centres

See Nos. 2194, 2219.

###### 945.2. Publicity, Propaganda (including Demonstration Forests)

2595. HEIKINHEIMO, O. **Vesijaon kokeilualueen vaiheita.** [History of the Vesijako experimental forest [Finland].] *Comm. Inst. for. Fenn.* 46 (2), 1955 (1957). pp. 83. [Fig.]

2596. DIEDLER, A. **Waldarbeiter-Wettbewerbe.** [Forest workers' competitions.] *Allg. Forstzeitschr.* 11 (5), 1956 (49-50). 9 refs. [G.]

Discusses organizing bodies, duration, participants, events, methods of judging, prizes etc., with examples from Germany, Austria, Switzerland, Finland and U.S.A.

2597. [School woodlands.] *Allg. Forstzeitschr.* 11 (12/13), 1956 (169-90). [G.]

A special number on the occasion of Arbor Day, with articles on history and aims of school forests and their formation in some German states. The number of woodlands, forest gardens etc. in W. German schools is estimated at nearly 2000.

###### 945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also Nos. 2553, 2597.

2598. WICHT, C. L. **Hoër-vakkundige bosbou-opleiding in Suid-Afrika.** [Higher education in forestry in South Africa.] *J. S. Afr. For. Ass.* No. 28, 1956 (17-26). [Afrik.afrik.e.]

Outlines early history and gives details of the 4-year B.Sc. curriculum at Stellenbosch, in which students study the same subjects for 2 years, then

divide into silviculture/management and wood-technology courses, the latter for utilization (saw-mills and preservation) and forest products research.

2599. FUJII, T. [Historical development of sub-professional forestry training in Japan.] *For. (industr.) Econ., Tokyo* 10 (3; 5), 1957 (34-7; 31-41). [Jap.]

A short review, tracing its beginnings in the Meiji era [1868-1912] during which the first schools were started and German influence, especially in organization, was high; through the Taisho era [1912-26] when centres multiplied and forestry instruction spread to secondary and then to primary schools, and both were given demonstration forest plots to manage; to the present Showa era [1926-], describing the impact of the depression and the subsequent recovery. By 1939 ca. 2100 trainees were passing out annually. Typical syllabuses and salaries at different periods are given.

2600. WINKELMANN, H. G. **Interim report to the Government of India on training of forest workers in northern India.** FAO, Rome. No. FAO/57/9/5931, 1957. pp. 21. Limited distribution.

2601. CARRIER, J. M. **Industrial visits of forestry students on the operations of St. Anne Power Company [with discussion].** *Repr. from Pulp Paper Mag. Can.* 58 (5), 1957 (239 ... 241).

Describes in detail the Company's co-operation with Laval University in acquainting undergraduates with the planning, organization, execution and control of cutting, hauling and driving timber. Three visits of not more than 3 days each to cover these operations, with short talks from key men, are recommended. Local costs are paid by the company.

2602. MEYER, A. B. **Forestry as a profession [in the U.S.A.]** Society of American Foresters, Washington. 1956. pp. 16. Price \$0.25.

Information on educational and training facilities, types of employment etc.

###### 945.4. Research

See also Nos. 1268-71, 2005, 2102, 2218-9, 2528-9, 2553, 2609.

2603. STEBBING, E. P. **Forestry research in India, Great Britain, the Dominions and the Colonies. Part II. The Dominions.** *Emp. For. Rev.* 36 (3), 1957 (246-50). [Cf. F.A. 18 No. 4834.]

2604. **Dix ans d'activité de la Station de Recherches et Expériences Forestières de l'École Nationale des Eaux et Forêts.** [Ten years' work at the forest research and experiment station of the École Nationale des Eaux et Forêts.] *Ann. Éc. Eaux For. Nancy* 15 (1), 1956 (169-336). [F.]

A full account of research carried out and in progress, as well as of the organization and equipment of the station, and a 20-page bibliography of publications by the staff.



2605. Erkenntnisse der sowjetischen Forstwirtschaft. [Findings of Russian forestry.] *Forst u. Jagd Spec. no.*, [1955?] pp. 36. [G.]

A special number, including translations from *Lesnoe Hozjajstvo* on: The effect of the environment on the anatomical and physiological characters of trees [*Lesn. Hoz.* 1955 (1), (20-4)], and The practice of thinnings and selection fellings in the light of the teaching of Mičurin and Lysenko [*Lesn. Hoz.* 1950 (1), (19-26); see *F.A.* 12 No. 99] (both by P. V. Voropanov); Accelerating germination in seeds of *Acer platanoides* [*Lesn. Hoz.* 1955 (3), (70-2)] (A. I. Savčenko); and Control of *Carex* spp. and grasses in reforestation [*Lesn. Hoz.* 1953 (4), (22-5)] (G. G. Junaš).

2606. SCHORY, E. A., SR. **Progress Report: Tropical Forestry Project.** Florida Forest Service, Fort Myers, Fla. 1957. pp. 21 + 1 photo.

[Cf. *F.A.* 18 No. 2384.] The most significant developments reported were: Successful planting out in the field of bare-rooted *Eucalyptus* (*E. grandis* and *E. tereticornis*) seedlings; successful summer planting of Eucalypt and other hardwoods; and confirmation of the need for adequate site preparation and cultivation for hardwood seedlings.

2607. Instituto Forestal Latino Americano de Investigación y Capacitación, Mérida. [Latin American Forestry Institute for Research and Training, Mérida.] *Bol. Inst. for. Latino Amer., Mérida* No. 1, 1957 (1-16). [Span.]

An account of the history, organization and present research programme of the Institute.

#### 946.2. Conferences and Excursions

See also Nos. 1284, 1379-80, 1877.

2608. Schweizerische Wald- und Holztagung 1957. [Swiss forestry and timber conference [proceedings] 1957.] *Beih. Z. schweiz. Forstver.* No. 28, 1957. pp. 216. [G., F. or It.]

Includes 15 talks, with discussion, by leading Swiss foresters, mostly on such general topics as the economic role of forestry, silvicultural and administrative means of raising production, development potential and raw-material requirements of the paper and board industries, farm forestry, and the legal basis of forest administration and management.

#### 946.3. Institutions, Institutes

2609. LARGURA, A. As atividades do Instituto Nacional do Pinho em 1956. [The work of the National Pine Institute in 1956.] *An. bras. Econ. flor., Inst. nac. Pinho* No. 9, 1957 (21-80). [Port.]

#### 95. Forest Taxation

2610. GRÜNEKLEE, H. G. Die forstliche Grundsteuer. [The [German] land tax as it affects forestry.] Institut für Forstpolitik der Universität Freiburg i. Br. 1956. pp. 203. [G.] Price DM.16. From review in *Allg. Forst u. Jagdztg.* 128 (8/9), 1957 (199).

Traces the history of this tax, now the main tax of local authorities, and the basis of assessment according to the law of 1 Dec. 1936 as it affects forestry. Compares the impact of this tax on public and private forestry enterprises in various parts of W. Germany on the one hand, and on forestry vs. agriculture on the other, and advocates reforms.

#### 97. International Forest Policy and Other International Collaboration

##### 971. Congresses, Conferences

2611. Report of the third session of the International Chestnut Commission (Italy, September 1955). [*Docum.*] *3e Sess. Comm. int. Chât.* No. FAO/CH Rev. 1, 1956. pp. 53. [E.]

Includes the following papers as Annexes: The *Castanetum* Zone and the distribution of *Castanea sativa* in Italy (A. Pavari); Ecological data forms for Chestnut in Italy; Chestnut sites in the *Lauretum* zone; Notes on the plant protection aspects of the study tour (A. Biraghi and G. Solignat); and Observations made during the study tour on cultural techniques, utilization and identification of types (A. de Philippis, J. Elorrieta Artaza and L. Lobina).

2612. Nyárfa—Konferencia. [Report on the Poplar Conference.] *Erdész. Kutatás., Budapest* 1957 (1/2), (3-18). [Hu.]

Held 23-29 Sept. 1956 by arrangement with the Hungarian Academy of Sciences, and attended by delegates from the U.S.S.R., Bulgaria, China, E. Germany, Korea, Rumania and also Austria and Belgium.

## FORESTRY THE WORLD OVER

References: 1. *C.P.P.A. Bulletin*, Montreal; 2. *Forest Products Journal*, Madison, Wis.; 3. *Forestry Newsletter for the Near East*, Cairo; 4. *Forêt-Conservation*, Quebec; 5. *Forst und Holzwirt*, Hannover; 6. *Hedeselskabets Tidsskrift*, Viborg; 7. *Holztechnik*, Mainz; 8. *Holz-Zentralblatt*, Stuttgart; 9. *India News*, London; 10. *I.U.P.N. Bulletin*, Brussels; 11. *New Scientist*, London; 12. *Pulp and Paper Magazine of Canada*, Gardenvale, Quebec; 13. *Timber Technology*, London; 14. *Timber Trades Journal*, London; 15. *Timberman*, Portland, Ore.; 16. *Wald und Holz*, Solothurn; 17. *Western Forester*, Portland, Ore.

**International.** The International Standards Organization has formed a new Technical Committee, No. 89, to deal with Fibre Building Boards. Its secretariat has been entrusted to the Technical Committee for Wood of the German Standards Organization, in Stuttgart. This is the second Technical Committee in the field of wood, the other being Committee No. 55 for sawn softwood, with a secretariat in Moscow (8; 30.1.58).

**British Guiana.** A U.S. firm plans to establish a pulp industry on the Essequibo River at an estimated cost of 16 million dollars. The installations will include a pulp mill with a daily capacity of 200 tons, two hydro-electric plants to provide power, docks and warehouses, and about 65 miles of railway (12; Feb. 1958).

**Canada.** The Ontario Paper Co., an associate of the Chicago Tribune, which manufactures newsprint and grows its own pulpwood, is experimenting with a number of indigenous and introduced Poplars. So far the most successful is the Italian hybrid 78B, which has reached pulpwood size in ca. 7 years, growing at a rate of ca. 6 ft. a year. Tests of the pulping quality of the wood are in progress (4; Jan. 1958).

**China.** Lumber production in China during the first Five-Year Plan (1953–57) is stated to be 98.54 million cu.m. Eighteen sawmills have been added to the industry since 1953 (13; March 1958).

**Egypt.** A forestry department and a wood-testing laboratory have been established at the College of Agriculture, Alexandria University (3; 1.2.58).

**Finland.** The two Central Forestry Associations have undertaken to organize the building of timber-haulage roads for the purpose of extracting timber from private forests at present without roads, railways or floatways. State loans will be arranged under the Forest Improvement Act. It is estimated that some 20,000 km. of such roads are required, of which only a few hundred km. have so far been completed. The Government Forest Service and big timber companies have already built access roads on a large scale (12; Feb. 1958).

**Germany.** The Forst- und Holzwirtschaftliche Institut, Hamburg-Reinbek, has approved the use of an infra-red radiator for the control of dry-rot in buildings. Maximum height of application is 3.6 m. It can be used for the irradiation of ceilings, walls and floors, and it is said that a 3-hour treatment kills the fungus completely. The radiator operates from 220-volt mains (d.c. or a.c.) (7; Jan. 1958).

As a protection against theft of Christmas trees, some owners of conifer plantations and curators of municipal parks sprayed their trees, before Christmas, with a substance which, at room temperature, will emit irritating gases, causing tears, coughs and sneezes to people in the same room (5; 16.12.57).

**Great Britain.** The Nature Conservancy has collaborated with Harwell and Kelvin Hughes Ltd. in investigating the possibility of detecting flaws in timber with the aid of the ultrasonic equipment used to detect flaws in metals. They have found that ultrasonic waves can be transmitted through fresh samples of Oak, Birch and Pine, but that the presence of slight flaws, formed either artificially or by parasites, considerably reduces the transmission. This technique may prove applicable to the diagnosis of heart rot and butt rot, which are hard to detect in the early stages of infection by present-day methods—methods that are themselves liable to damage the wood tissue (11; 12.12.57).

**Iceland.** A tax on cigarettes has been introduced, to be used to finance forest planting. Last year the tax collected amounted to one million kroner, about a quarter of the total amount at the disposal of the Forest Service (6; 10.12.57).



**India.** The Government of India have approved a 3-year scheme for an all-India soil and land-use survey. The object is to formulate a national policy for all phases of soil survey and cartographic work, including the standardization of methods. A central survey office has been set up at the Indian Agricultural Research Institute, New Delhi, and 4 regional offices are to be established (9; 8.2.58).

**Netherlands.** The partial derailment of a goods train caused such damage to the concrete sleepers of the track, that 2300 had to be replaced. It has been decided to revert to wooden sleepers, which are less liable to damage from such mishaps (8; 12.12.57).

**Réunion.** A biological reserve is being established in order to preserve the relict type of vegetation peculiar to the 'Bois de Couleur des Bas'; it will cover an area of 50 acres in the district of St. Philippe and will preserve a type that has almost completely disappeared from the island. The possibility of establishing two other reserves is being considered, one on the 'Bois de Couleur des Hauts', and the other in the Tamarisk forests (10; Dec. 1957).

**Sweden.** A Swedish engineer, T. Dahlberg, has designed the 'Lignometer', a light-weight (6 lb.) apparatus with caliper-like arms for recording mensurational data and code numbers. It automatically registers diameter (to nearest  $\frac{1}{4}$  in.), form point, height, and bark thickness, and has 8 symbols for species and 3 for fallen, dead standing, and damaged trees respectively. Every 'n'th stem of a given size can be automatically recorded for further sampling and marked by a spray gun. The enumerator punches his signature to his section of the record tape. The instrument won a first prize at the Paris Inventions Fair (14; Dec. 1957).

**Switzerland.** A Swiss insurance company has been offering to cover damage to power saws (after the first 20% or first Swiss Fr.25) against a premium of 2.5% of the purchase price, with a minimum of Fr.100 for each policy, distributable over several saws belonging to different owners. It now appears the risk was underestimated, and the company now stipulates for a minimum premium of Fr. 100 for any one saw, a rate at which the offer loses most of its practical interest (16; Jan. 1958).

**U.S.A.** Some 1800 adults of *Aphidoletes thompsoni*, a parasite of *Adelges piceae*, have been imported from Czechoslovakia in an effort to control this introduced pest of Balsam Fir in Washington and Oregon (1; Dec. 1957).

Quercetin has been successfully derived from Douglas Fir bark and processed for use in protecting rubber, plastics, petroleum, insecticides, animal feeds, hydraulic fluids, and vegetable and animal oils from deterioration when in contact with air (1; Dec. 1957).

The manufacture of a synthetic broth ('Bouillon gras') from sulphite waste liquor is still in the experimental stage, but laboratory trials are promising and the product is said to be indistinguishable in flavour from real meat broth (4; Dec. 1957).

Rayonier Inc. reports the development of a new synthetic fibre from waste liquor of pulp mills, which is produced from lignin. Even Hemlock bark and needles are stated to be usable (2; Aug. 1957).

The Oregon Forest Research Center, Corvallis, was inaugurated in Nov. 1957 in a new \$500,000 building entirely constructed of wood (17; Dec. 1957).

A 150-ft. suspension bridge of diagonally-braced steel trusses with 5-ft. width of wooden decking to accommodate laden pack-animals, is under construction in a deep gorge of the San Joaquin River, 65 miles from Fresno, Calif. Most of the bridge materials, i.e. 34 tons, are being lifted by a 260-h.p. helicopter, carrying up to 500 lb. per trip which it places within 25 ft. of the abutments. The two cables went up overland, each carried by a 6-animal train. In a similar operation, 16,000 lb. of lumber was transported in 4½ hours for the construction of a look-out at 5,500 ft. in the Mount Baker National Forest, Wash., a task that would have taken a 6-mule train and 12 men some 15 days (15; 15.11.57).

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P.O. Box 334

Pretoria

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